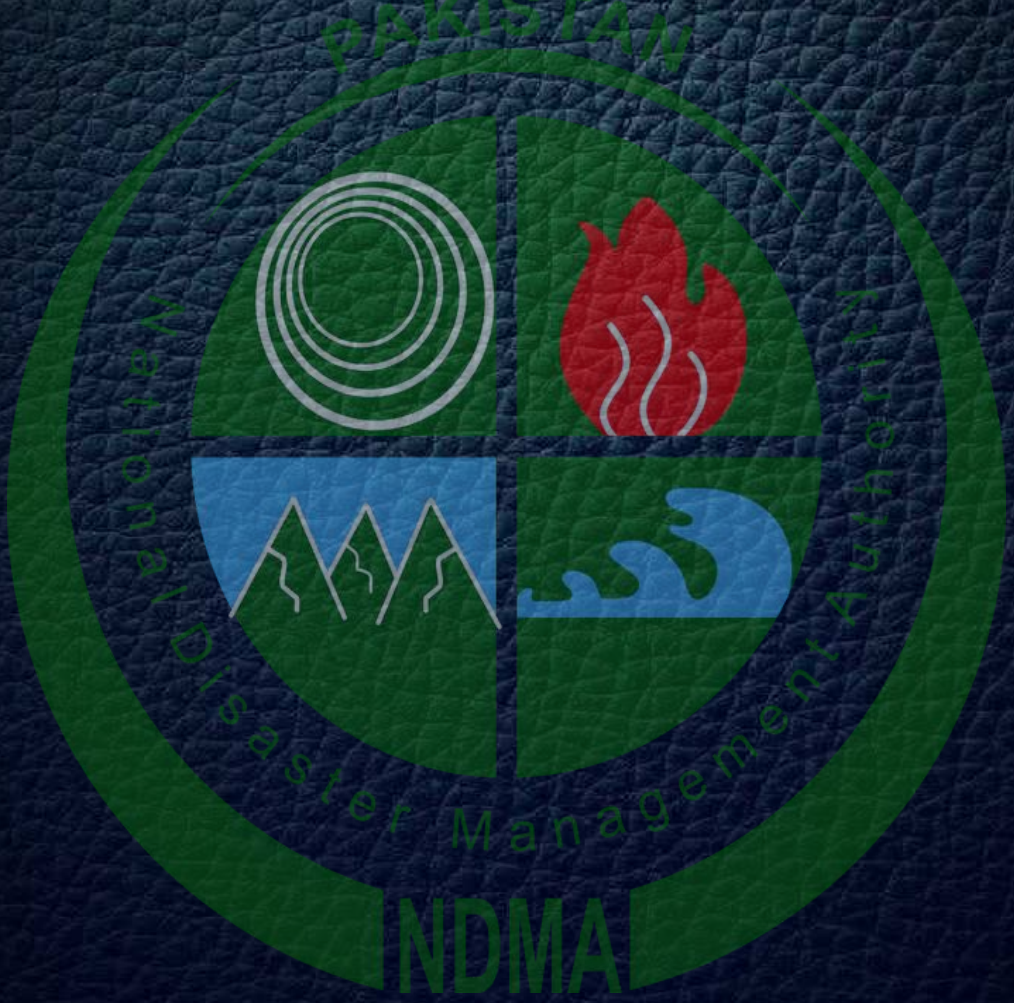
GLOBAL BEST PRACTICES

For Disaster Mitigation & Management

2026

NATIONAL DISASTER MANAGEMENT AUTHORITY
(NDMA), PAKISTAN

BEST PRACTICES FOR DISASTER MITIGATION & MANAGEMENT



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CHAIRMAN'S MESSAGE

Lieutenant General
Inam Haider Malik, HI(M)
Chairman NDMA

The National Institute of Disaster Management (NIDM) is the National Think Tank of the National Disaster Management Authority (NDMA). It serves as a vital entity in addressing Pakistan's vulnerability to a wide spectrum of disasters, including earthquakes, floods, droughts, GLOFs, cyclones, landslides, forest fires, heatwaves as well as man-made disasters.

NIDM extends support to NDMA through research and development, innovative solutions and recommendations with national/global best practices on disaster management.

With a mission to enhance disaster preparedness and response, NIDM is a knowledge hub, conducting research, trainings and capacity building programs in collaboration with government departments, responders, communities and industries. NIDM is collaborating with 400 universities around the globe and adapting the latest research and best practices for mitigating natural disasters regarding the complete spectrum of disaster management.

This document contains best practices based on national academia input and internationally adopts best practices on disaster management. NIDM has made significant strides, impacting over thousands of individuals through training programs and simulation exercises, conducting research to inform evidence-based policies, and collaborating on disaster risk reduction strategies.

Recognizing operational gaps highlighted by recent disasters, including the 2022 floods, NDMA is restructuring NIDM to focus on "Know Risks," "Know Early," and "Pre-emptive Preparedness." Additionally, initiatives like establishing an NDMA e-library and NIDM portal for volunteer registration will further enhance information dissemination and community engagement, fostering a proactive, knowledge-driven approach toward building a safer and more resilient future for Pakistan.

FOREWORD

In the rugged terrain of Pakistan, nestled between majestic mountain ranges and sprawling plains, lies a land of contrasts—a land blessed with a breathtaking natural beauty yet haunted by the specter of recurring natural disasters. From the towering peaks of the Himalayas to the fertile valleys of the Indus River, this nation has borne witness to the devastating forces of floods, earthquakes, heatwave, landslides, glacier melting, avalanches, GLOFs, Cyclones and wildfires which has leave an indelible impact on communities and nation. Yet, within the chaos and destruction, there lies a beacon of hope, the collective efforts of individuals, organizations, and governments striving to mitigate the impact of such catastrophes.

It is within this context that the compendium you hold in your hands emerges—a testament to the tireless dedication and innovative solutions employed in the realm of natural disaster management. As the world grapples with an increasing frequency and severity of such events, the need for effective strategies has never been more pressing. This publication serves as a beacon of knowledge, illuminating the path towards more disaster resilient communities and a safer world. Within booklet, you will find a wealth of best practices, gleaned from the scientific articles, organizational booklets and the experiences of experts, practitioners, stakeholders from around the globe. Each contingency includes invaluable insights and recommendations from pre-disaster preparedness to post-disaster recovery.

It is a testament to the unwavering determination to rebuild, to adapt, and to thrive in the face of adversity, to the power of collaboration forged across borders, disciplines, and sectors to confront the challenges that transcend individual capabilities. As this compendium of best practices in natural disaster management will be disseminated across Pakistan. The insights and recommendations contained within a booklet, communities will be better equipped to prepare for, respond to, and recover from natural disasters. This booklet encapsulates the essence of our collective efforts to foster resilience, collaboration, and innovation in the face of adversity. As individuals, organizations, and governments embrace the lessons learned and embark on a shared journey towards disaster resilience, we move closer to realizing a future where disasters no longer evoke despair, but instead inspire transformative change and enduring resilience.

As we navigate an increasingly complex and interconnected world, the lessons contained within this booklet serve as the way forward in our shared quest for disaster resilience. Together, let us make a safe future where disasters no longer sow seeds of despair, but instead become catalysts for positive changes

ABOUT NIDM

Pakistan's susceptibility to natural disasters, evidenced by events like the 2010 super floods and the 2005 earthquake, underscores the need for dedicated disaster management institutions. NIDM was established by NDMA in 2010 to serve as a national think tank and knowledge hub for disaster management

Role and Objectives:

NIDM serves as a national think tank and knowledge hub for disaster management in Pakistan, aiming to:

Enhance Disaster Preparedness and Response:

Equip individuals and communities with the skills and knowledge to mitigate disaster impact through training and capacity building programs.

Promote Evidence-based Decision-making:

Inform policymakers with data and insights for effective disaster management strategies through research on disaster risks and vulnerabilities.

Foster Collaboration and Partnerships:

Create a coordinated and effective disaster management system by working closely with national and international counterparts, Government agencies, NGOs, academic institutions, and the private sector.

Remodeled National Institute of Disaster Management (NIDM):

The transformation of NIDM into a national think tank reflects a proactive and strategic approach to disaster management in Pakistan. This evolution is aimed at strengthening nationwide preparedness through policy innovation, strategic engagements, and enhanced regional coordination. By 2026, NIDM conducted 356 comprehensive training sessions, equipping more than 19,656 individuals with the skills and knowledge required to strengthen disaster response and resilience across the country. NIDM has also established strong global partnerships with 462 international universities, think tanks, and research institutes to promote collaborative research and knowledge exchange. These partnerships are strategically aligned according to hazard and geographic similarities — linking cold-region universities with institutions in Pakistan's northern mountainous areas, coastal universities with Pakistan's coastal regions, and plain-area institutions with counterparts in Pakistan's plains. This region-specific collaboration ensures focused research on hazards unique to each geographical zone.These initiatives are advancing evidence-based solutions, strengthening institutional capacity, and enhancing Pakistan's overall disaster management framework.

Patronage

This book has been prepared under the patronage of Lieutenant General Inam Haider Malik, HI (M) Chairman, National Disaster Management Authority.

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KEY FUNCTIONS

Research and Development:

Conduct research on disaster risks, vulnerabilities, and best practices in disaster management.

Training and Capacity Building:

Provide training programs on various aspects of disaster preparedness, response, and recovery for government officials, disaster response personnel, and community members.

Knowledge Management:

Establish and maintain a comprehensive database of disaster-related information and resources.

Advocacy and Awareness Raising:

Raise public awareness about disaster risks and promote community- based disaster preparedness initiatives.

Professional Development Initiatives:

By 2026, NIDM conducted numerous training sessions and workshops nationwide. Over 356 training sessions equipped over 19,656 individuals with essential disaster management skills.

Collaborations in Disaster Management:

NIDM collaborates with national and international universities to facilitate research exchanges and capacity building. Strategic engagements with over 400 universities have led to partnerships with 155 institutions.

Research Projects:

NIDM's research projects focus on critical areas such as glacial lake outburst floods, urban flooding, and air pollution (SMOG). These projects aim to inform evidence-based policies and strategies for disaster risk reduction.

NIDM's Transformation:

Responding to the gaps exposed by recent disasters, NIDM is being remodeled to become a more proactive entity built on three pillars:

1. Know Risks: Develop a comprehensive understanding of potential hazards and their associated risks.
2. Know Early: Enhance early warning systems and forecasting capabilities.
3. Pre-emptive Preparedness: Implement proactive mitigation strategies to minimize disaster impact.

From Training to National Think Tank:

NIDM's focus is shifting from solely training personnel to acting as a national think tank for all aspects of disaster management, including:

Proactive Adaptation and Management Strategies: Formulate evidence-based strategies for disaster adaptation and management.

Systematic Reviews and Urban Resilience: Conduct regular reviews of DM practices and promote measures to enhance urban resilience.

DM Training and Retention: Strengthen training programs and ensure the retention of skilled professionals in the DM field.

Policy Support: Provide policy guidance and support to PDMAs, DDMAs.

Collaboration and Knowledge Sharing:

NIDM promotes collaboration through various initiatives:

National Universities: Engage in research and development with national universities in their respective zones, addressing both specialized and interdisciplinary aspects of disaster management.

Funding and International Collaboration: Secure funding from donors and facilitate collaboration between Pakistani and international universities to ensure high-quality research.

Human Resource Database: Create a repository of qualified disaster management professionals to facilitate their deployment during future disasters.

Regional NIDMs: Establish Regional NIDMs within relevant universities in collaboration with PDMAs, bridging the gap between research institutions and end-users. These centers will assess user needs and facilitate research collaboration with national universities.

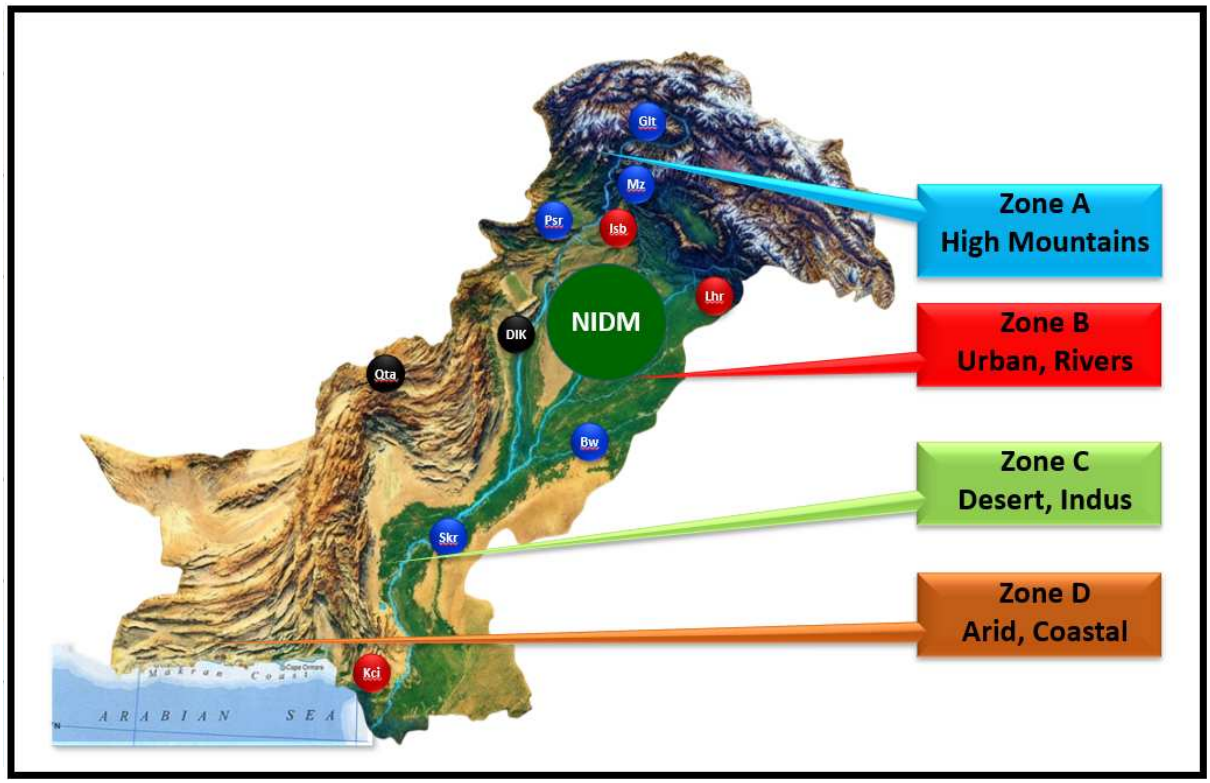
Establishment of NDMA E- Library:

The project of NDMA E-Library, initiated by NIDM, aims to modernize information dissemination within NDMA. This digital platform will centralize resources for easy access during emergencies.

GLOBAL CONNECTIVITY BEST PRACTICES FOR DISASTER MITIGATION AND MANAGEMENT

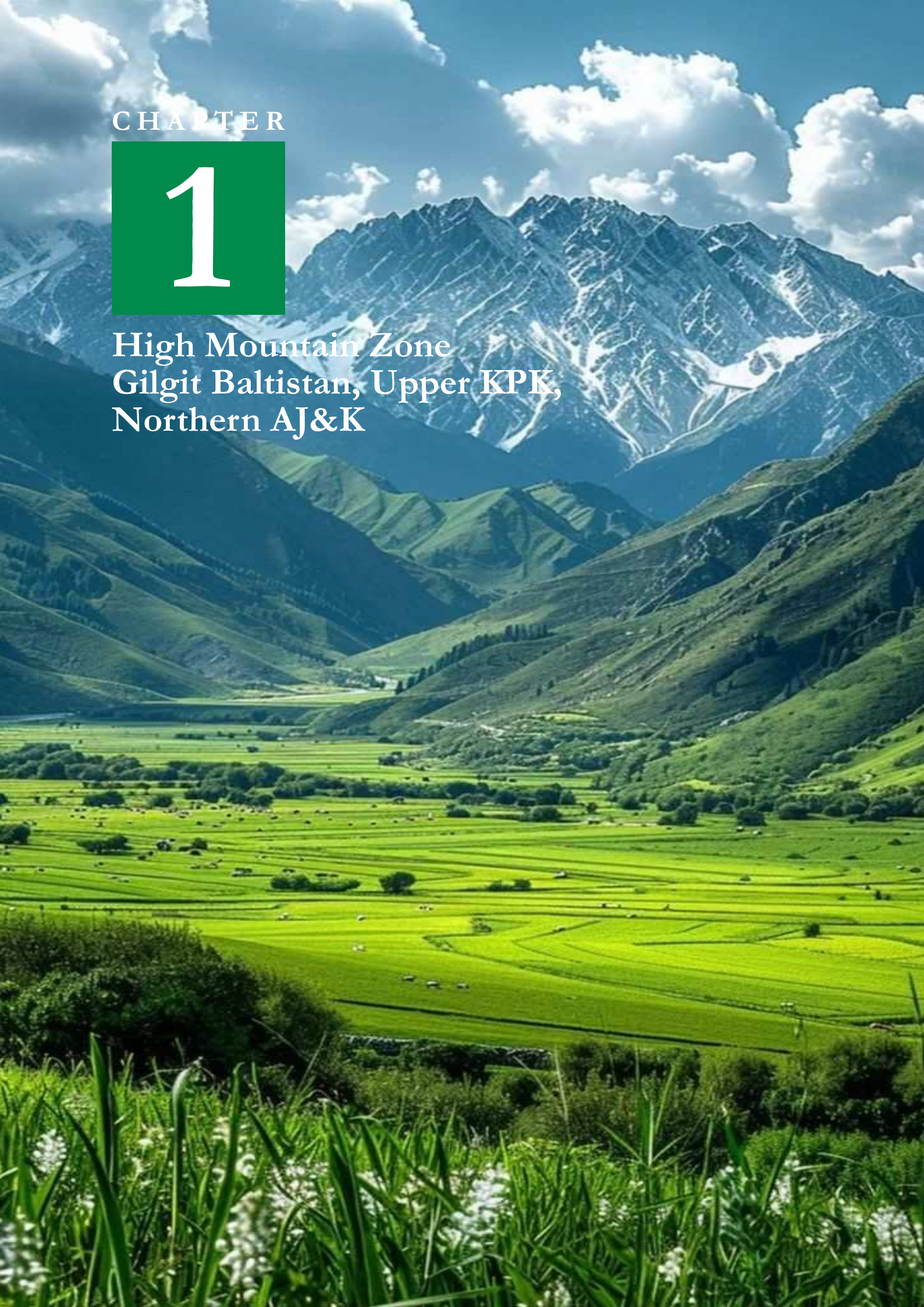
Natural disasters are a global phenomenon that can strike with devastating consequences, affecting communities, economies, and ecosystems. Around the world, countries face a range of natural hazards, including earthquakes, floods, cyclones, and droughts, each with its unique set of challenges and impacts. Pakistan is a disaster-prone country, facing a range of natural and man-made hazards that pose significant risks to its population, infrastructure, and economy.

Pakistan's diverse geography presents a unique landscape that is prone to a variety of natural disasters across its five distinct zones. Pakistan is situated at the crossroads of various tectonic plates and characterized by diverse geographical features, natural disasters pose significant risks to its population and infrastructure. The country frequently experiences earthquakes, particularly in regions such as Kashmir and Khyber Pakhtunkhwa, with notable events like the 2005 Kashmir earthquake leaving lasting scars on communities. Additionally, Pakistan is prone to devastating floods during the monsoon season, affecting millions of people and causing widespread damage to homes, agriculture, and infrastructure. The



coastal areas of Sindh and Balochistan also face the threat of cyclones and tsunamis. Droughts further exacerbate challenges, particularly in arid regions such as Balochistan, leading to water scarcity and agricultural losses. Despite these challenges, efforts to improve disaster preparedness, early warning systems, and resilience are crucial for mitigating the impacts of natural disasters in both Pakistan and around the world. Moreover, factors such as rapid urbanization, deforestation, and inadequate infrastructure exacerbate the country's vulnerability to disasters, underscoring the urgent need for comprehensive risk reduction and disaster management strategies.

Through knowledge-sharing initiatives, seminars and trainings, NDMA aims to build the capacity of stakeholders at all levels, including government agencies, responders, and local communities, to effectively mitigate and respond to disasters. NDMA is working towards creating a more resilient and disaster-resilient Pakistan, better equipped to withstand and recover from natural and man-made hazards by integrating academic expertise and best practices. By collaborating with academic institutions, NDMA can access cutting-edge research, innovative methodologies, and expert insights to enhance disaster preparedness, response, and recovery efforts.



CHAPTER

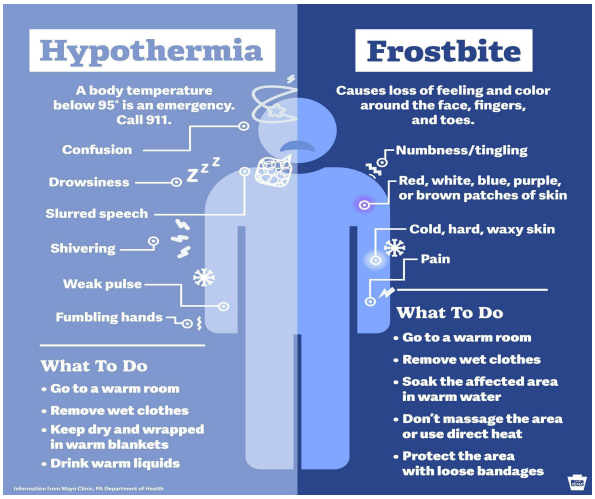
1

High Mountain Zone Gilgit Baltistan, Upper KPK, Northern AJ&K

(a) Contingency – Heavy Snow Fall

National Academia Input
Individual & Community Level

- Plan trips based on weather forecasts and stay updated with weather advisories.
- Conduct door-to-door campaigns to educate communities on clearing rooftops and pathways during heavy snow.
- Ensure proper ventilation and install carbon monoxide alarms to prevent CO build-up.
- Encourage tourists and residents to carry emergency kits, snow chains, and winter tires.
- Follow inclined rooftop designs and use salts and shovels to clear roads and sidewalks.
- Maintain body temperature to prevent hypothermia or frostbite by wearing warm clothing and consuming high-protein foods.



International Academia Input
Individual & Community Level

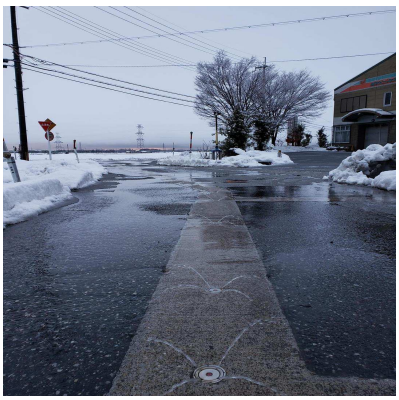
- Share snow clearing activity updates on municipal websites (Canada).
- Implement district-level centralized heating systems (China).
- Identify and support vulnerable populations (Sweden).
- Establish specialized snow emergency shelters for vulnerable individuals.
- Strategically plant shrubs or trees along roadsides for faster snowmelt in targeted areas, aiding in ice buildup prevention.

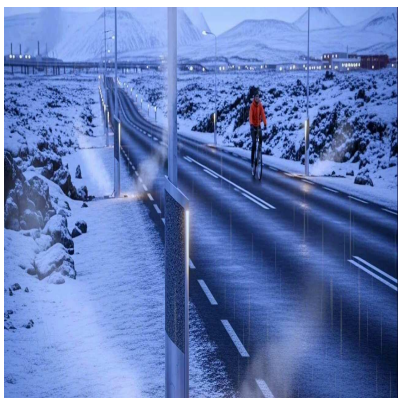
National Academia Input
Area Governance

- Deploy snow removal crews promptly for primary and secondary road clearance.
- Maintain local government warehouses stocked with salt spreaders and medical supplies, and ensure sufficient machinery for snow clearing.
- Regulate snow tourism through legislation and enforcement agencies. Provide timely and clear public warnings, recommendations, and precautions for potential hazards.
- Make recommendations such as car chains and transportation advice readily available.
- Use snow fences or "living snow fences" (e.g., rows of trees or other vegetation) to minimize blowing and drifting snow on critical roadway sections.

International Academia Input
Area Governance

- Utilize apps and automated radio channels for real-time weather and road condition alerts (Germany).
- Instruct community elders/mobilizers through social media groups (Switzerland).
- Implement centralized heating and ventilation systems.
- Keep emergency kits with essential tools in houses and vehicles.
- Explore domestic-scale interventions such as snowbots (Holland).
- Provide first Aid training to recognize and treat frostbite and hypothermia.



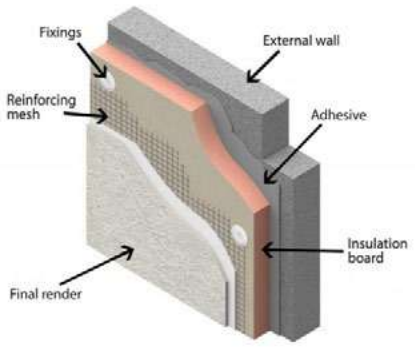


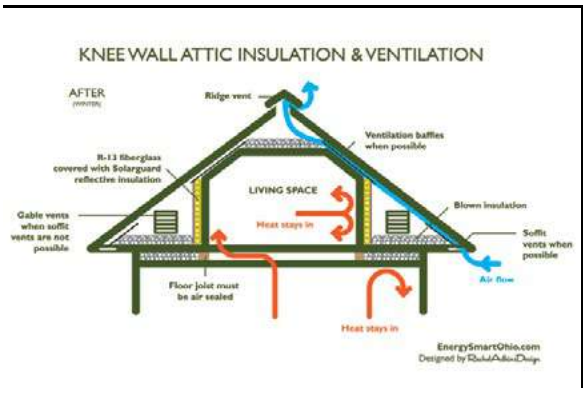
National Academia Input
Role of Federal Organizations

- Deploy specialized snow clearing machinery/ vehicles for critical road revival in priority areas.
- Share timely warnings and advisories with relevant stakeholders.
- Conduct risk assessments to identify problematic areas and implement mitigation plans.
- Collaborate with stakeholders to support recovery efforts in affected areas.
- Retrofit public buildings to withstand snow loads and prevent roof collapse.
- Discourage flat roofs in heavy snowfall areas.

International Academia Input
Role of Federal Organizations

- Utilize advanced electronics technology for efficient application of road clearing materials.
- Promote installation of carbon monoxide monitors and alarms in homes.
- Ensure critical infrastructure is winter ready and durable.
- Coordinate with other agencies and stakeholders to share resources during significant snowfalls.
- Improve building insulation in walls and attics.
- Develop and enforce of building codes for roof snow loads.



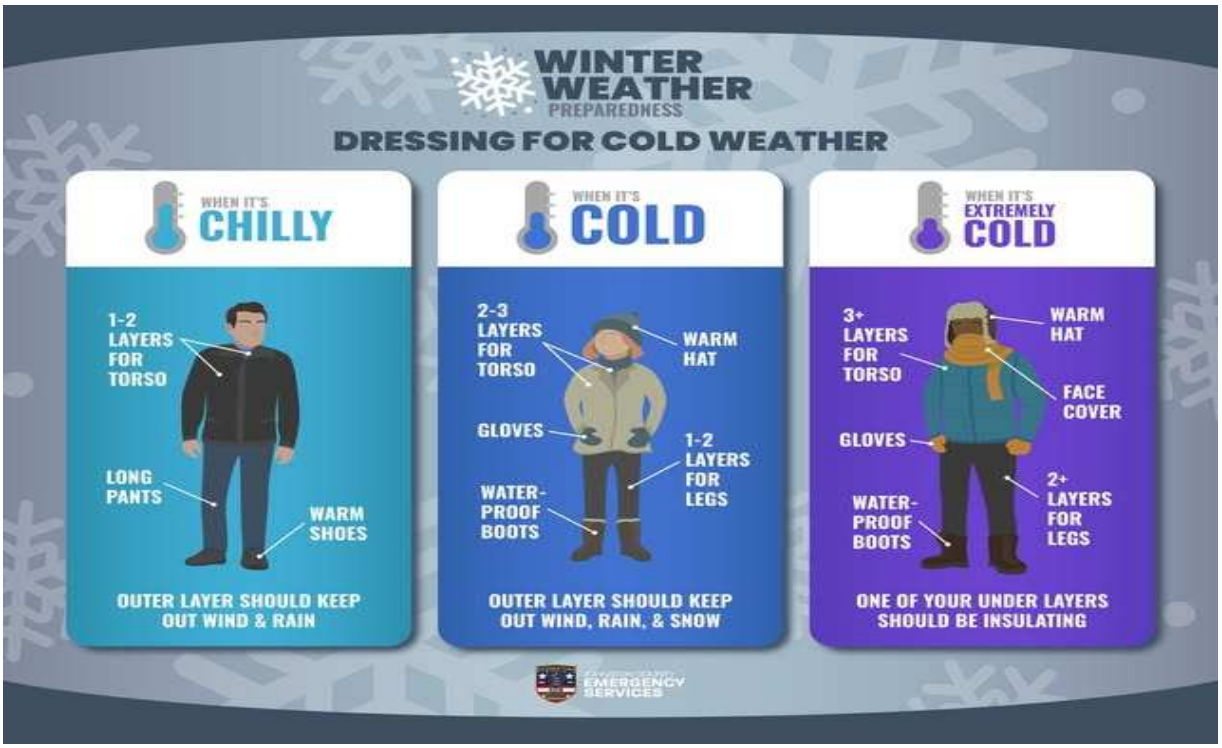


National Academia Input
Private Sector and Local Industry Role

- Offer remote work options during hazardous conditions.
- Establish communication channels and collaborate with local authorities for updated information.
- Produce suitable winter clothing for heavy snowfall areas in the industrial sector.

International Academia Input
Private Sector and Local Industry Role

- Identify critical clients needing immediate attention during heavy snowfall.
- Provide tourism guidelines (DOs and DON'Ts) for activities in heavy snowfall areas.
- Ensure availability of services such as snowplows for parking lots, salt for icy areas, and basic safety equipment to prevent workplace injuries.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Conduct risk communication and information management.
- Aid local administration in rescue, evacuation and relief operations.
- Identify at-risk populations vulnerable during prolonged power outages.
- Post warning signs at local parks, county fairs, and other outdoor venues.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Identify vulnerable populations like the elderly, disabled, and low-income individuals.
- Conduct workshops or campaigns on heavy snowfall risks, including hypothermia, slips, falls, and carbon monoxide poisoning.
- Organize outreach and promote accessible heating centers for vulnerable populations.
- Provide guidance and counselling to disaster victims during recovery efforts.
- Ensure availability of services like snowplows, salt for icy areas, and safety equipment.
- Place safety equipment to prevent workplace injuries.
- Educate school children on hail dangers and safety precautions.

National Academia Input
Area Academia, Think Tanks

- Research the impacts of heavy snowfall on health, social, economic, and environmental aspects.
- Identify hazards related to heavy snowfall through filed research and share best mitigation practices.
- Develop scenario planning for relevant authorities based on research insights.
- Engage academia and community volunteers in affected areas for proactive measures.

International Academia Input
Area Academia, Think Tanks

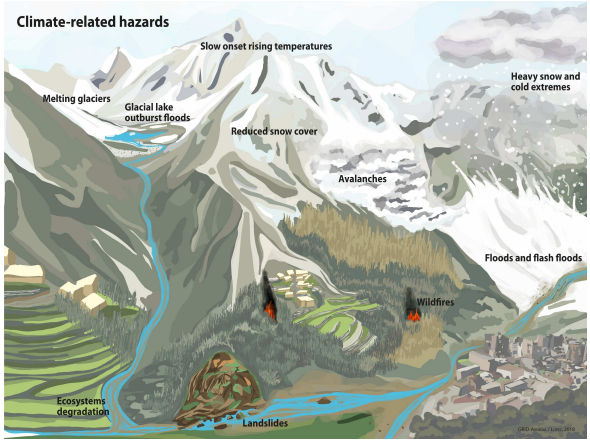
- Facilitate communication and coordination among stakeholders like policymakers, emergency responders, NGOs, and communities.
- Offer expert advice and recommendations to communities through mass communication channels.
- Develop winter contingency policies to advocate for people and communities.
- Use anti-icing agents before snowfall to prevent ice formation, simplifying subsequent removal efforts.

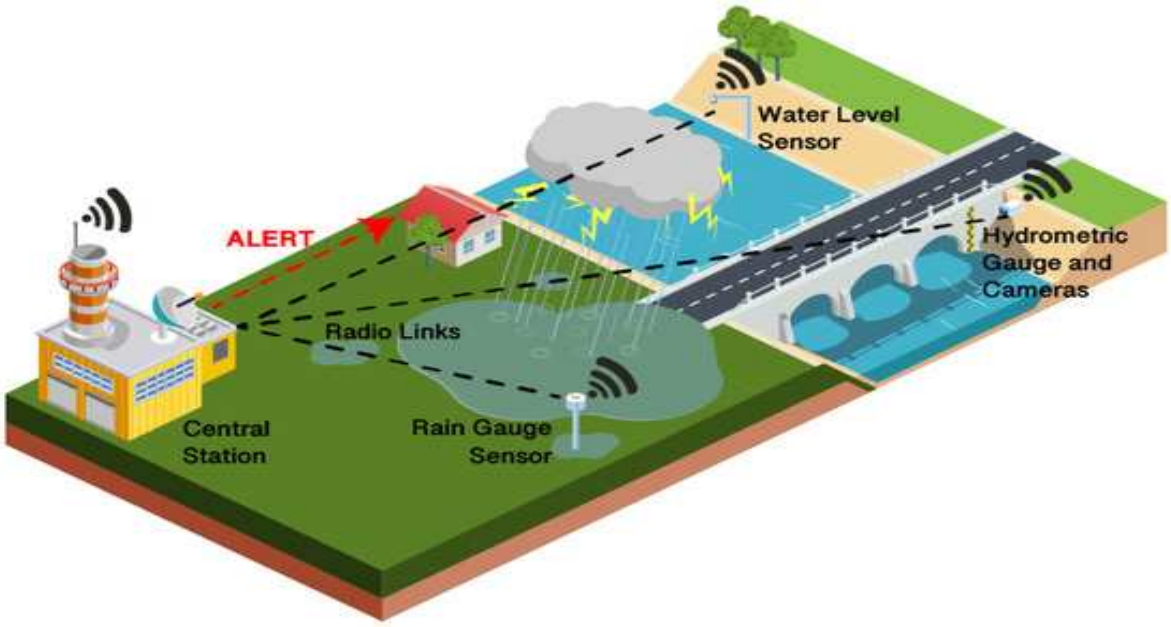
National Academia Input
Local Media and Early Warning Center

- Utilize electronic and digital media for awareness campaigns.
- Establish and maintain early warning systems for timely and accurate snowfall information.
- Report on authorities' preventive measures; local cable operators should also share advisories from DDMAs/PDMAs.
- Prioritize safety in media coverage over sensationalism.
- Capture local residents' experiences through media reporting.

International Academia Input
Local Media and Early Warning Center

- Emphasize safety measures in local media and early warning center communications.
- Use multimedia formats like photos, videos, infographics, and maps to make information engaging and accessible.
- Equip structures like dams, dikes, and storm surge barriers with sensors and automated control systems to respond to changing conditions.
- Verify facts and debunk false claims on social media for factual reporting and reduced panic.
- Adopt a comprehensive approach in MHEWS for preparedness across scenarios.



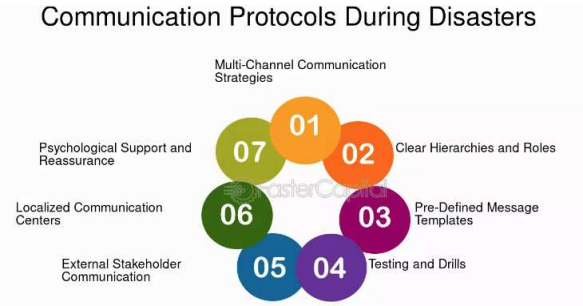


National Academia Input
Search & Rescue, Law Enforcement

- Keep search and rescue teams vigilant during heavy snowfall in remote or challenging terrains.
- Law enforcement officers provide crucial Route-Finding Assistance during these operations.
- Collaborate with law enforcement, emergency services, and other agencies for coordinated efforts in search and rescue missions.
- SAR teams offer vital support to communities, especially in wilderness or mountainous areas where traditional emergency services may face challenges.

International Academia Input
Search & Rescue, Law Enforcement

- Law enforcement agencies collaborate with search and rescue teams during heavy snowfall incidents.
- SAR teams use multiple search methods, such as avalanche transceiver searches, RECCO detectors, slalom probing, and avalanche search dogs, to locate buried victims simultaneously.
- If electronic aids or dogs are unavailable or ineffective, SAR teams conduct systematic slalom probing or grid searches in avalanche deposit zones.
- SAR teams stay connected and coordinate efforts using communication devices like radios, cell phones, and emergency apps.



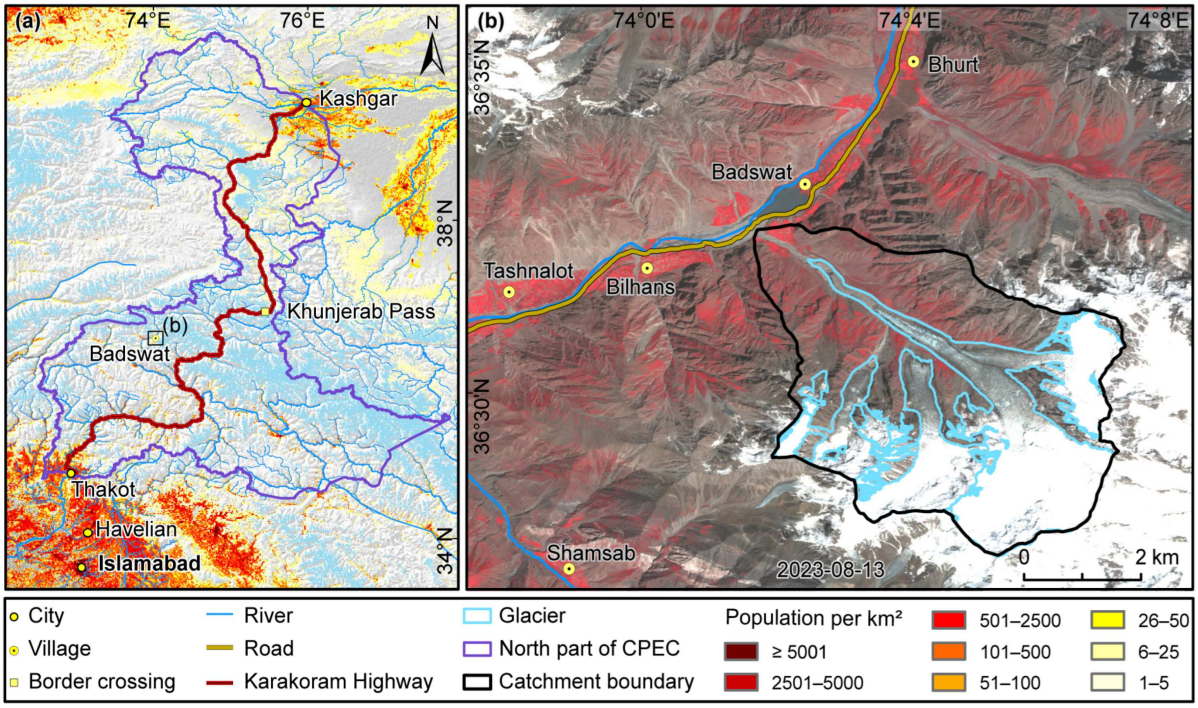
(b) Contingency – Rising Temperatures, Abnormal Heat

National Academia Input
Individual & Community Level

- Use early warning systems widely to give communities advance notice.
- Plant trees and vegetation for shade to lower temperatures, reduce air conditioning needs, improve air quality, and protect against UV radiation.
- Manage heat impacts on employees in mountainous areas for their safety and well-being, especially to prevent flooding events due to abnormal heat.
- Assist farmers in adapting to climate change by adjusting crop cycles, diversifying crops, and implementing water-efficient irrigation practices.

International Academia Input
Individual & Community Level

- Educate individuals and communities on adapting to rising temperatures and abnormal heat to build resilience.
- Support vulnerable populations during abnormal heat in mountainous areas with culturally appropriate information and services, including language support and community engagement.
- Stay informed about changing weather patterns, particularly sudden thunderstorms.
- Manage mountain water resources effectively and implement water conservation measures.

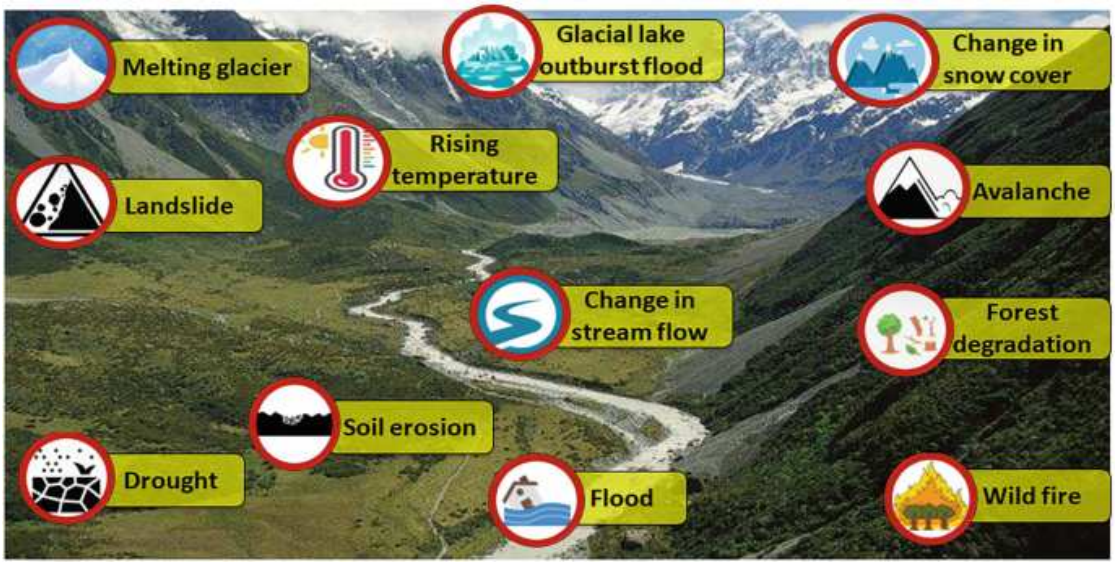


National Academia Input
Area Governance

- Use early warning Systems (EWS) to monitor potentially dangerous glacial lakes, providing early warnings to downstream communities
- Implement regulations and permit systems to manage visitor numbers and ensure responsible use of mountain resources.
- Develop and enforce local regulations and guidelines for construction and development projects in mountain areas.
- Encourage the adoption of climate-smart agricultural practices.

International Academia Input
Area Governance

- Establish monitoring systems to track temperature changes, glacier melting rates, and environmental indicators for effective response to abnormal heat events.
- Develop heat action plans and raise awareness about heat risks among local communities and tourists in mountain areas.
- Integrate heat mitigation strategies into urban planning by increasing green spaces, planting trees, and using reflective materials in buildings to reduce urban heat islands.
- Recommend infrastructure improvements and implement sustainable water management practices.
- Promote renewable energy sources like solar and wind power to reduce reliance on fossil fuels.



National Academia Input
Role of Federal Organizations

- Develop national frameworks.
- Implement building codes prioritizing energy-efficient design, insulation, and passive cooling techniques to reduce indoor temperatures and lessen reliance on air conditioning during heatwaves.
- Enact heat protection laws in mountainous areas during abnormal heat to safeguard public health and ensure worker safety.
- Promote sustainable mountain development, fostering cooperation among countries with mountainous territories to address climate change, biodiversity conservation, and achieve Sustainable Development Goals (SDGs).

International Academia Input
Role of Federal Organizations

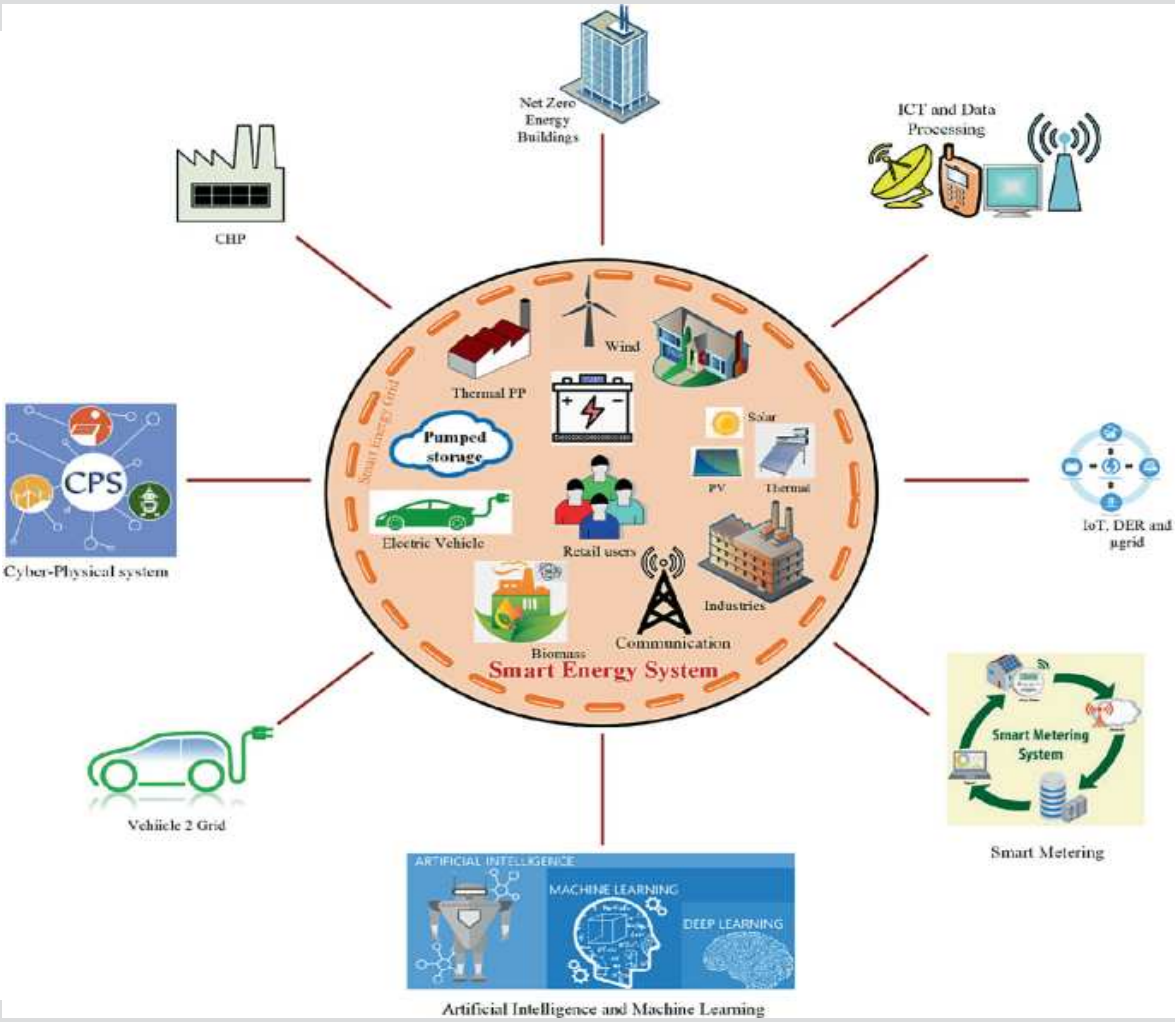
- Fund research initiatives to mitigate abnormal heat and melting in hilly areas through programs and grants addressing extreme heat and climate change impacts.
- Develop climate models for abnormal heat in mountainous areas, considering factors like topography, altitude, and climate variability to understand impacts on mountain ecosystems.
- Enact occupational heat standards and legislation in several states to protect workers, particularly in industries like agriculture and construction, with provisions for safety procedures and training.

National Academia Input
Private Sector and Local Industry Role

- Transition to renewable energy sources like solar or wind power to reduce reliance on fossil fuels and lower greenhouse gas emissions.
- Implement energy-efficient technologies and practices in production and supply chains to minimize energy consumption.
- Partner with local communities and organizations to launch educational campaigns raising awareness about heatstroke risks and promoting heat safety measures.
- Integrate climate change adaptation and mitigation into corporate social responsibility (CSR) initiatives, supporting local communities' resilience efforts and well-being.

International Academia Input
Private Sector and Local Industry Role

- Adopt water-saving technologies and practices, promote water conservation among employees, and support sustainable water management initiatives.
- Develop and promote building materials with improved thermal insulation for construction in hot climates.
- Collaborate with research institutions or government agencies to create cost-effective early warning systems for heatwaves and extreme weather in mountainous regions.
- Invest in green infrastructure projects like rooftop gardens, urban green spaces, and tree planting to regulate local temperatures and create cooler microclimates.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Work at the grassroots level with vulnerable communities to enhance their understanding of risks and promote preparedness measures.
- Maintain stockpiles of essential supplies for quick availability.
- Support infrastructure improvements and mobilize volunteers and resources using culturally sensitive approaches to mitigate disasters.
- Coordinate logistics and supply chain management for timely delivery of resources to affected populations.

International Academia Input
NGOs, Humanitarian Resource Enablers

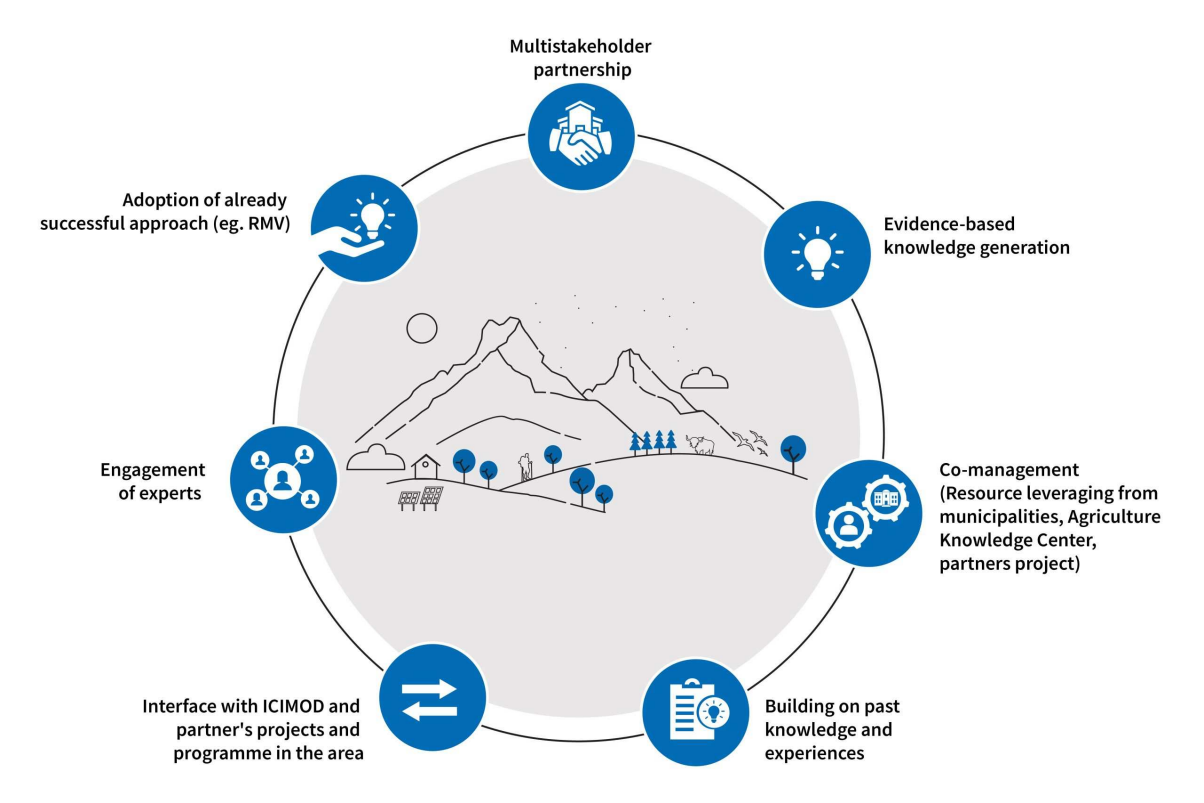
- Educate and prepare communities for disaster risk reduction through interactive meetings, audio-visuals, handbills, competitions, mock drills, and exercises.
- Maintain close communication and collaboration with local authorities and disaster management teams for a coordinated response during abnormal snow melting.
- Promote sustainable livelihoods by creating small business opportunities.
- Prioritize ethical considerations in humanitarian work, including principles of impartiality, neutrality, and respect for human dignity. Ensure relief efforts prioritize the well-being and rights of affected populations.

National Academia Input
Area Academia, Think Tanks

- Analyze rising temperatures' effects on glaciers, snow cover, and water resources to understand temperature trends and extreme weather events.
- Study ecological and socio-economic consequences of abnormal melting.
- Investigate effectiveness and limitations of various adaptation and mitigation strategies.
- Support sustainable land use practices that enhance carbon sequestration.
- Provide training programs for local authorities, community leaders, and NGOs on climate change adaptation, heatwave preparedness, and sustainable resource management.

International Academia Input
Area Academia, Think Tanks

- Share research findings through publications, presentations, and workshops to inform policymakers, communities, and stakeholders about challenges and solutions.
- Support livelihood diversification for communities affected by climate change.
- Advocate for international cooperation and financial resources for climate action in mountain regions.
- Facilitate knowledge exchange and best practice sharing among academia, policymakers, communities, and international organizations addressing similar challenges in other mountainous areas.

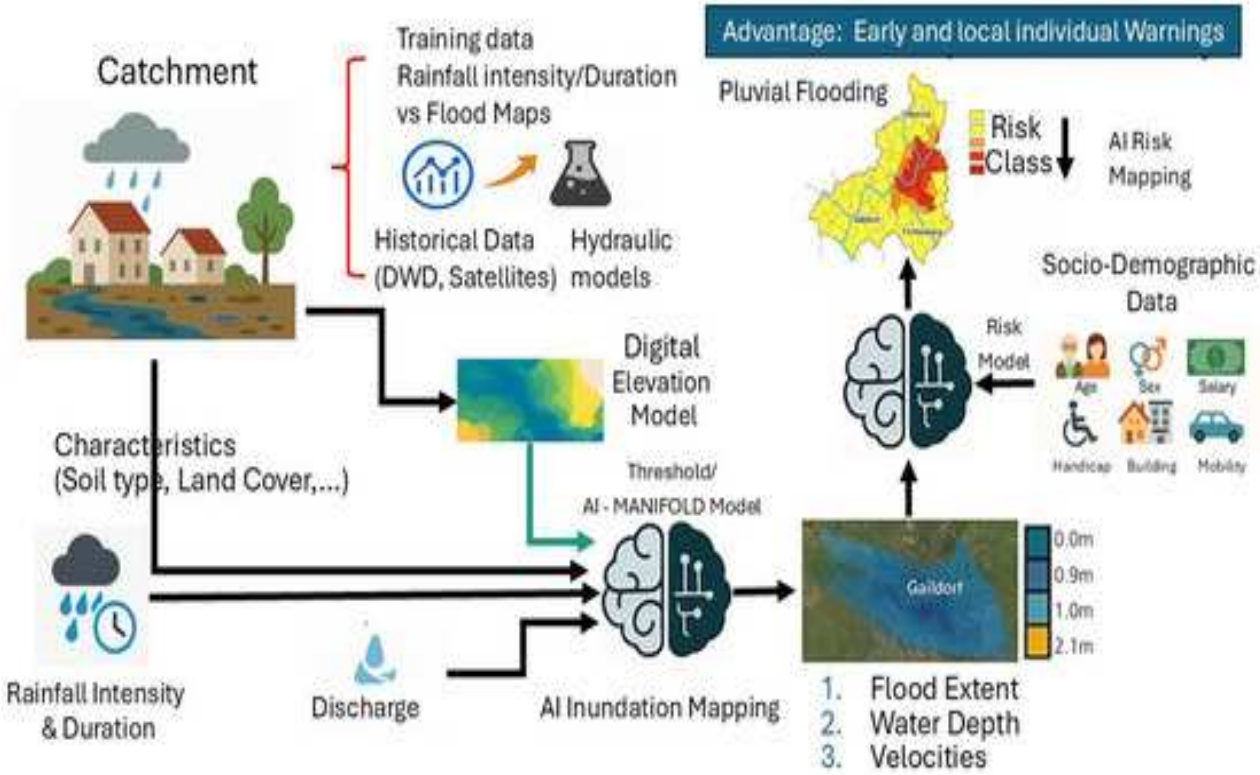


National Academia Input
Local Media and Early Warning Center

- Offer consistent updates on weather forecasts, heat advisories, and extreme weather events.
- Conduct interviews with scientists, climate change experts, and local authorities to explain rising temperatures, their impacts, and adaptation strategies.
- Share personal stories of individuals and communities affected by heat waves to raise awareness and promote empathy.
- Develop and broadcast public service announcements in local languages with precise information on heat safety and emergency response protocols.

International Academia Input
Local Media and Early Warning Center

- Disseminate heat advisories through diverse channels such as local media, SMS alerts, and community communication networks.
- Leverage advanced warnings and forecasts from organizations like the Japan Meteorological Agency (JMA) for typhoons, heavy rainfall, and flooding events, utilizing weather radar, satellite imagery, and numerical weather prediction models.
- Use culturally sensitive language and visuals that are easily understood by the target audience in the specific mountainous region.
- Combine satellite and radar data for broader coverage and more precise monitoring of water levels, precipitation, and potential flood risks.

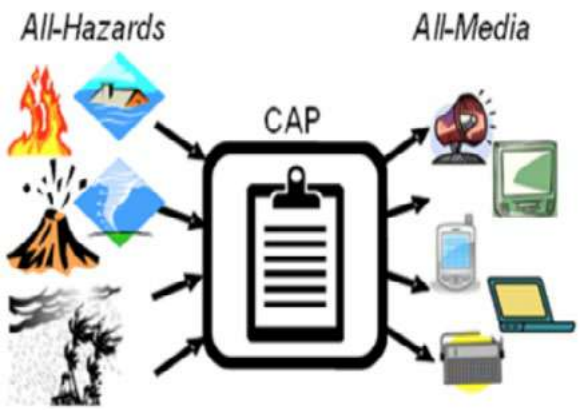


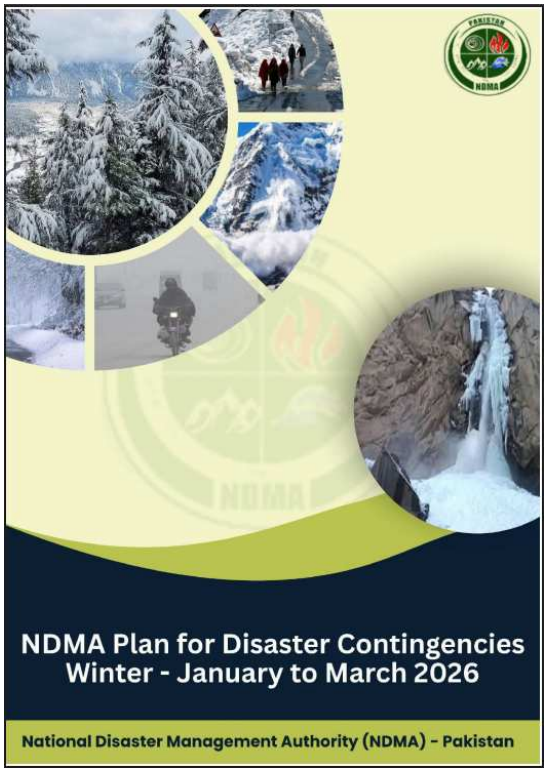
National Academia Input
Search & Rescue, Law Enforcement

- Conduct training programs and establish protocols for Search & Rescue (SAR) and law enforcement personnel to prepare for hot weather conditions before deployment.
- Develop partnerships with local authorities, volunteer groups, and specialized teams to enhance response capacity.
- Create contingency plans to handle the increase in heat-related incidents, including resource prioritization and personnel allocation.

International Academia Input
Search & Rescue, Law Enforcement

- Incorporate drones for rapid investigation, thermal imagery, and situational awareness in search and rescue operations.
- Collaborate with other agencies to ensure a prompt and coordinated response to heat-related emergencies in mountainous regions.
- Utilize various communication channels to disseminate information on safe hiking practices during hot weather, stressing proper hydration, sun protection, and advance trip planning.

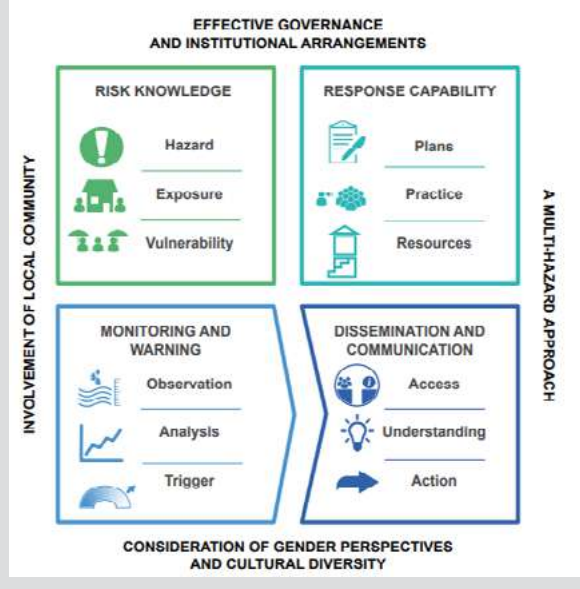




(c) Contingency – HKH Abnormal Melting, Altered Rivers

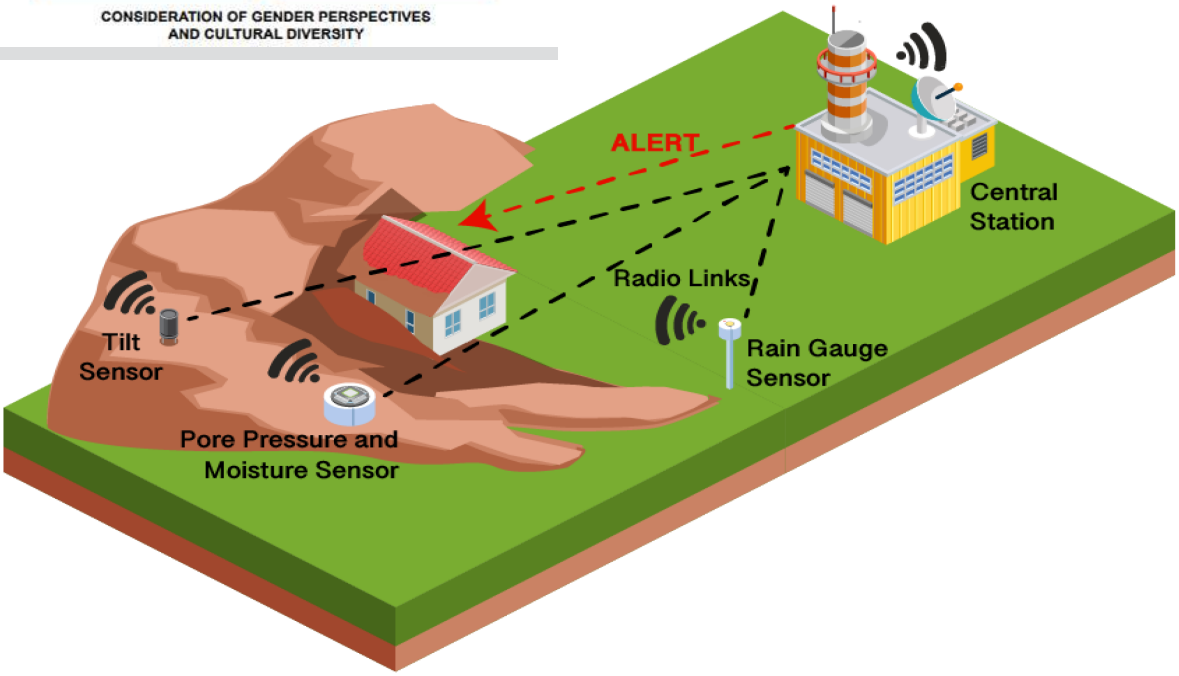
National Academia Input
Individual & Community Level

- Establish a straightforward warning system within the community for rapid communication about abnormal melting or river pattern changes.
- Create and practice simple contingency plans at the community level, including preparedness measures and coordinated actions for swift and effective response during unusual river events, prioritizing community safety.
- Advocate for avalanche harvesting and the development of small artificial glaciers or ice stupas to address water scarcity challenges.



International Academia Input
Individual & Community Level

- Set up and manage a local alert network to promptly notify community members about abnormal melting and changes in river pattern.
- Create and rehearse community-specific contingency plans detailing simple and efficient actions to be taken during abnormal melting events. Involve establishing safe evacuation routes, emergency shelters, and strategies for managing altered river flows.
- Recommend restricting construction in areas prone to glacial lake outburst floods as a cost-effective way to mitigate the devastating impact of such events.



National Academia Input
Area Governance

- Implement Develop and implement strategic plans at the local governance level to construct resilient infrastructure capable of withstanding abnormal melting and altered river patterns, minimizing the impact on communities.
- Foster collaboration among local governance, authorities, and relevant agencies to establish coordinated responses, share information, and implement effective contingency measures for abnormal melting and altered river flows.
- Enforce zoning regulations and limit development in high-risk areas to prevent human settlements and infrastructure from direct exposure to hazards like Glacial Lake Outburst Floods (GLOFs) in mountainous regions.
- Promote the adoption of climate-smart agricultural practices to enhance resilience to climate-related challenges.

International Academia Input
Area Governance

- Create comprehensive plans at the local governance level that consider the risks of abnormal melting and altered river flows, ensuring coordinated and effective responses.
- Encourage active participation of local governance in community awareness programs, emergency planning, and collaborative initiatives with experts and NGOs to tackle challenges arising from changing river dynamics.
- Utilize synthetic aperture radar imagery for detecting changes in water bodies and lake formations, and consider remote lake monitoring from space as a viable solution.

National Academia Input
Role of Federal Organizations

- Set up community-based alert systems at the local level to inform residents about abnormal melting and changes in river patterns.
- Create and practice simple and easy-to-follow contingency plans within the community for swift and effective response during unusual river events.
- Develop comprehensive baseline information on glaciers across the entire HKH region, including major basins and sub-basins.

International Academia Input
Role of Federal Organizations

- Promote collaboration among countries, global organizations, and environmental agencies to exchange data, knowledge, and resources for a unified global response to abnormal melting and altered river flows.
- Create a standardized global contingency framework, spearheaded by international organizations, to establish protocols and coordinated responses for countries dealing with the effects of abnormal melting and altered river dynamics.
- Utilize historical events, geotechnical and geomorphologic aspects of lakes/dams and their surroundings, and identification of other physical variables for field observations to enhance identification processes.

National Academia Input

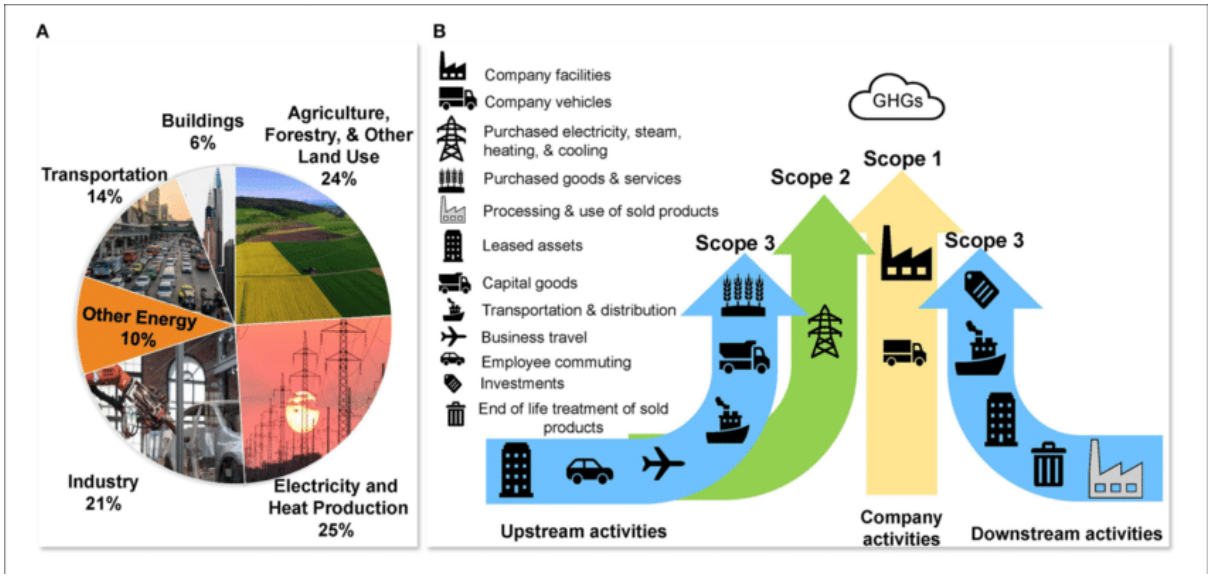
Private Sector and Local Industry Role

- Implement water-efficient technologies and adopt responsible waste management practices locally to mitigate the impact of abnormal melting.
- Collaborate with local communities to develop and implement emergency plans and support sustainable initiatives.
- Contribute to climate change mitigation efforts by reducing greenhouse gas emissions.

International Academia Input

Private Sector and Local Industry Role

- Collaborate with industries globally to exchange best practices and resources for a coordinated response to abnormal melting.
- Adhere to global sustainability standards to tackle abnormal melting challenges at a broader level.
- Shift towards renewable energy sources, advocate for sustainable practices, and support reforestation initiatives to help reduce greenhouse gas emissions.

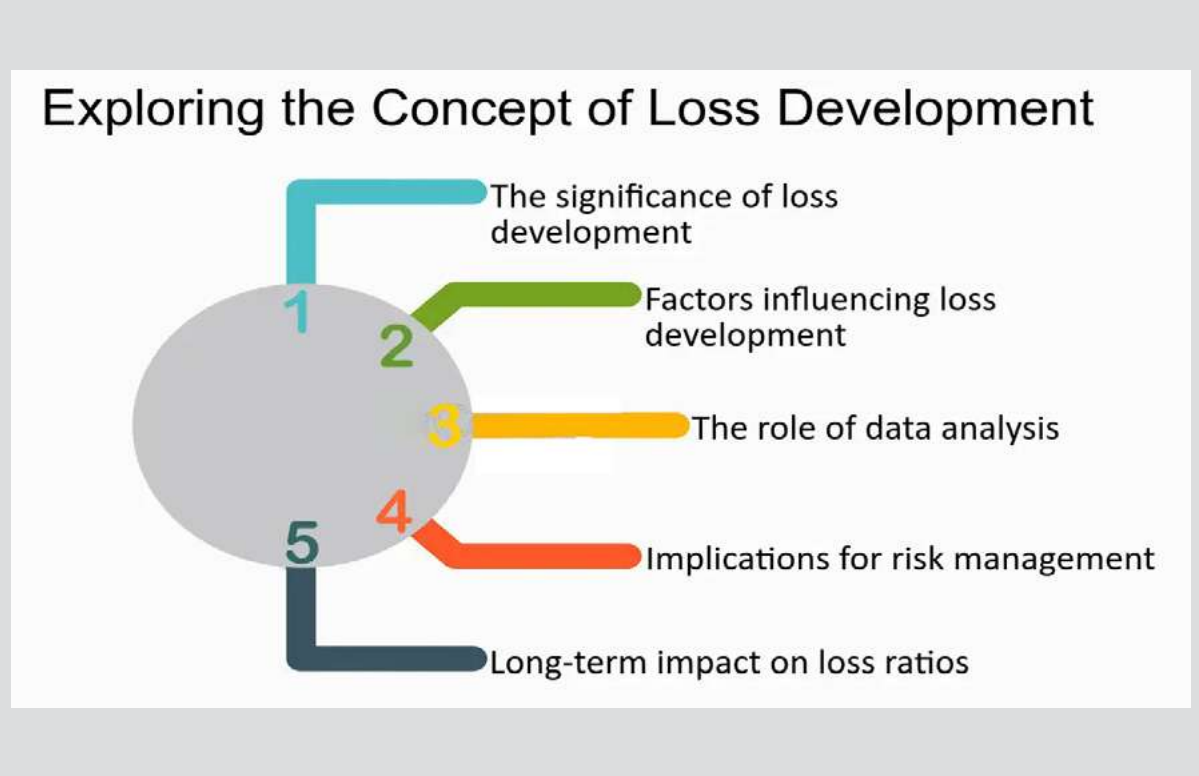


National Academia Input
Local Media and Early Warning Center

- Disseminate specific alerts about abnormal melting through local media for community awareness.
- Work closely with local communities to educate everyone on appropriate responses during abnormal melting events.

International Academia Input
Local Media and Early Warning Center

- Share alerts about abnormal melting internationally to facilitate coordinated responses across borders.
- Utilize local media platforms to raise awareness globally about abnormal melting and promote preparedness measures.



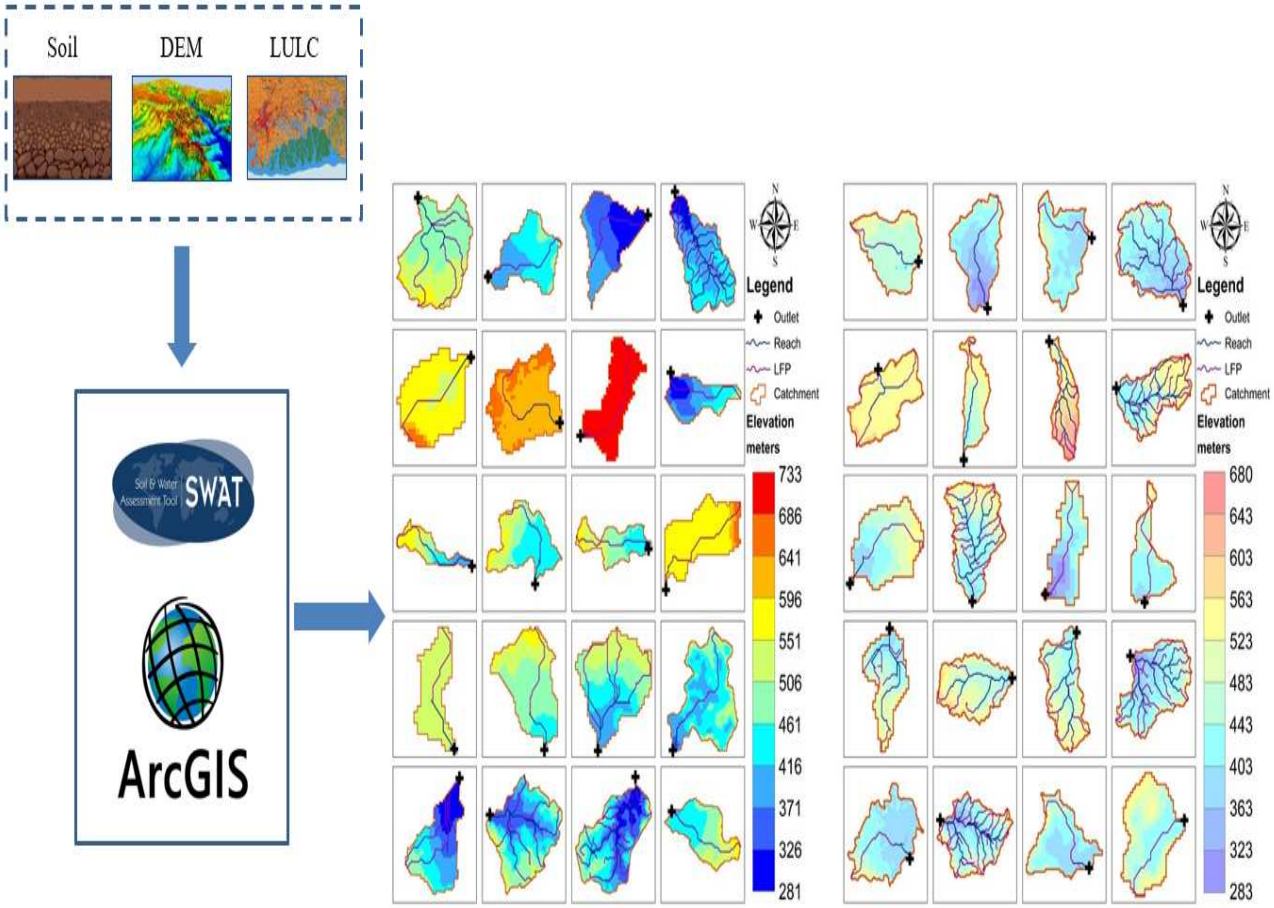
(d) Contingency – Avalanches, Land / Mudslides, Soil Degradation

National Academia Input
Individual & Community Level

- Stay informed with local weather alerts, keep an emergency kit, and create a family communication plan.
- Check and secure household utilities while learning basic first aid skills.
- Engage in community preparedness initiatives and support environmental conservation efforts to enhance overall resilience against disasters.
- Involve local communities in developing and operating early warning systems customized to their needs and vulnerabilities. Utilize cost-effective technologies like community-based rain gauges and mobile phone alerts for timely warnings and community response facilitation.

International Academia Input
Individual & Community Level

- Enhance disaster preparedness by staying informed via local government alerts and community-based communication networks.
- Maintain personal emergency kits with essentials like water, food, and first aid supplies, customized to region-specific risks such as earthquakes and tsunamis.
- Participate in neighborhood watch groups and community emergency response teams to foster collective preparedness and coordination during disasters.
- Contribute to local environmental conservation efforts to mitigate climate-related disasters and strengthen community resilience against various types of disasters.

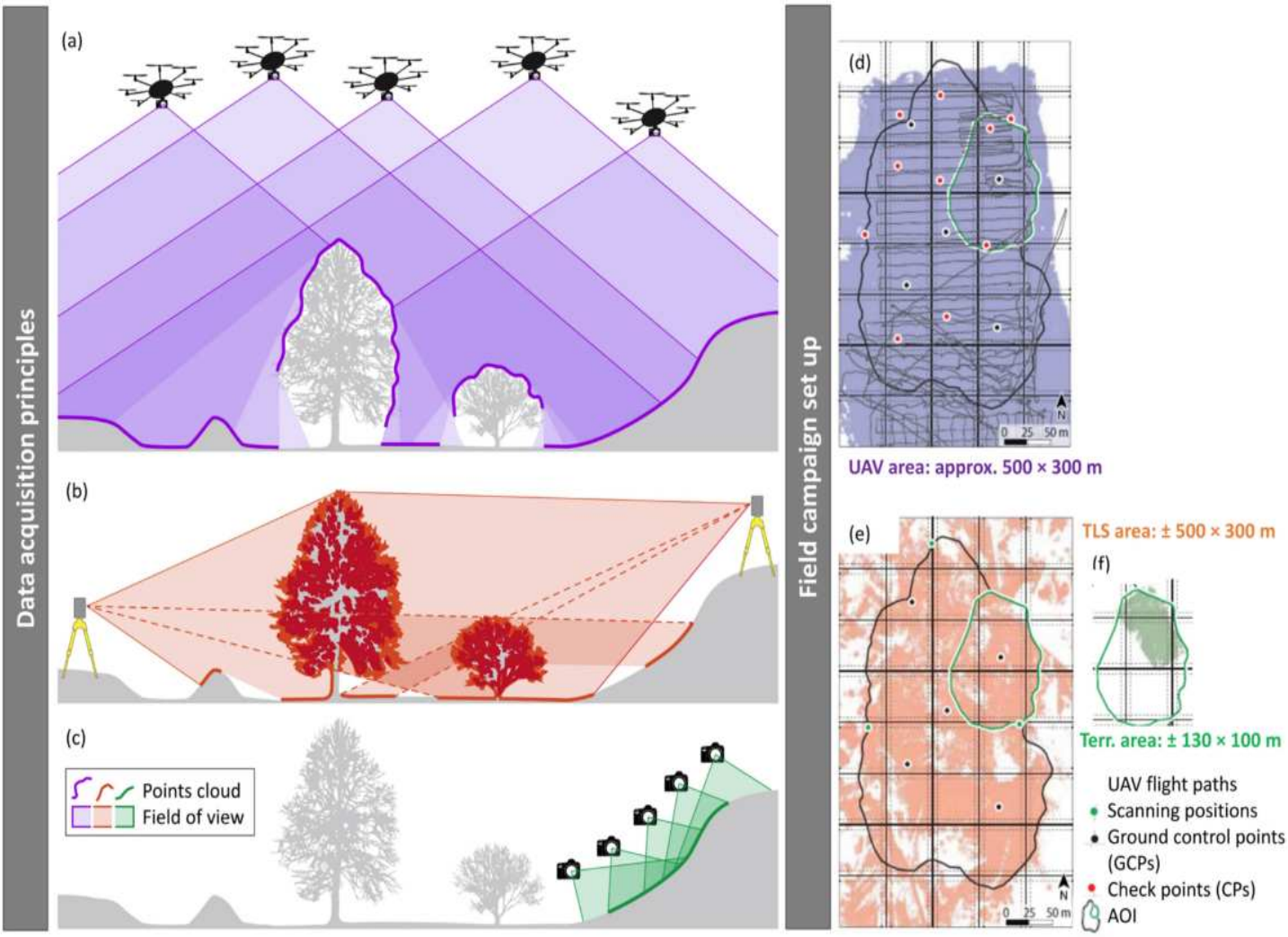


National Academia Input
Area Governance

- Identify high-risk areas susceptible to avalanches, landslides, and soil issues.
- Utilize 2D and 3D Geophysical Imaging for enhanced risk assessment.
- Implement effective warning systems to promptly alert communities.
- Reinforce infrastructure such as buildings and roads to withstand potential disasters.
- Implement measures to protect land and vegetation, reducing soil-related hazards and enhancing natural safety.
- Provide education and assistance to communities in emergency planning and preparedness.

International Academia Input
Area Governance

- Promote international collaboration to share information and build skills for dealing with avalanches, land/mudslides, and soil problems.
- Utilize advanced instrumentation like inclinometers, piezometers, and ground-based radar for real-time monitoring of ground conditions and water levels.
- Set up a global system to warn people early about these disasters and facilitate effective responses.
- Standardize emergency response protocols to ensure uniformity in disaster management.
- Develop cross-border planning strategies to address risks in areas susceptible to disasters that may impact multiple countries.
- Provide training and assistance to resource-limited countries, enabling them to enhance their preparedness and response capabilities.



National Academia Input
Role of Federal Organizations

- Conduct comprehensive risk assessments and continuous monitoring to identify vulnerable areas.
- Integrate landslide risk considerations into land-use planning processes and enforce zoning regulations to restrict development in hazard-prone areas. Require comprehensive geotechnical assessments for construction projects in landslide-prone regions.
- Develop and maintain early warning systems for timely alerts to at-risk communities.
- Invest in infrastructure resilience measures to minimize damage from natural disasters.
- Engage with local communities through education and empowerment programs.
- Implement sustainable land management practices to prevent soil degradation and reduce risks.

International Academia Input
Role of Federal Organizations

- Implement advanced monitoring systems for early detection of avalanches, landslides, and soil degradation.
- Implement measures to stabilize slopes and reduce erosion, such as planting vegetation, constructing retaining walls, installing erosion control structures, and adopting sustainable land management practices.
- Conduct extensive public awareness campaigns to educate citizens about risks and safety measures.
- Retrofit critical infrastructure and incorporate disaster-resistant design standards.
- Ensure seamless coordination between federal organizations, local authorities, and stakeholders.
- Invest in research and development for innovative mitigation strategies and technologies.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Conduct community-based risk assessments to identify vulnerable areas and populations prone to avalanches, landslides, and soil degradation.
- Provide training and capacity-building initiatives for local communities on emergency preparedness, evacuation procedures, and first aid skills.
- Support sustainable land management projects and environmental conservation efforts to mitigate soil erosion and reduce the risk of natural disasters.
- Collaborate with government agencies, local stakeholders, and other NGOs to coordinate disaster response efforts and ensure effective assistance to affected communities.

International Academia Input
NGOs, Humanitarian Resource Enablers

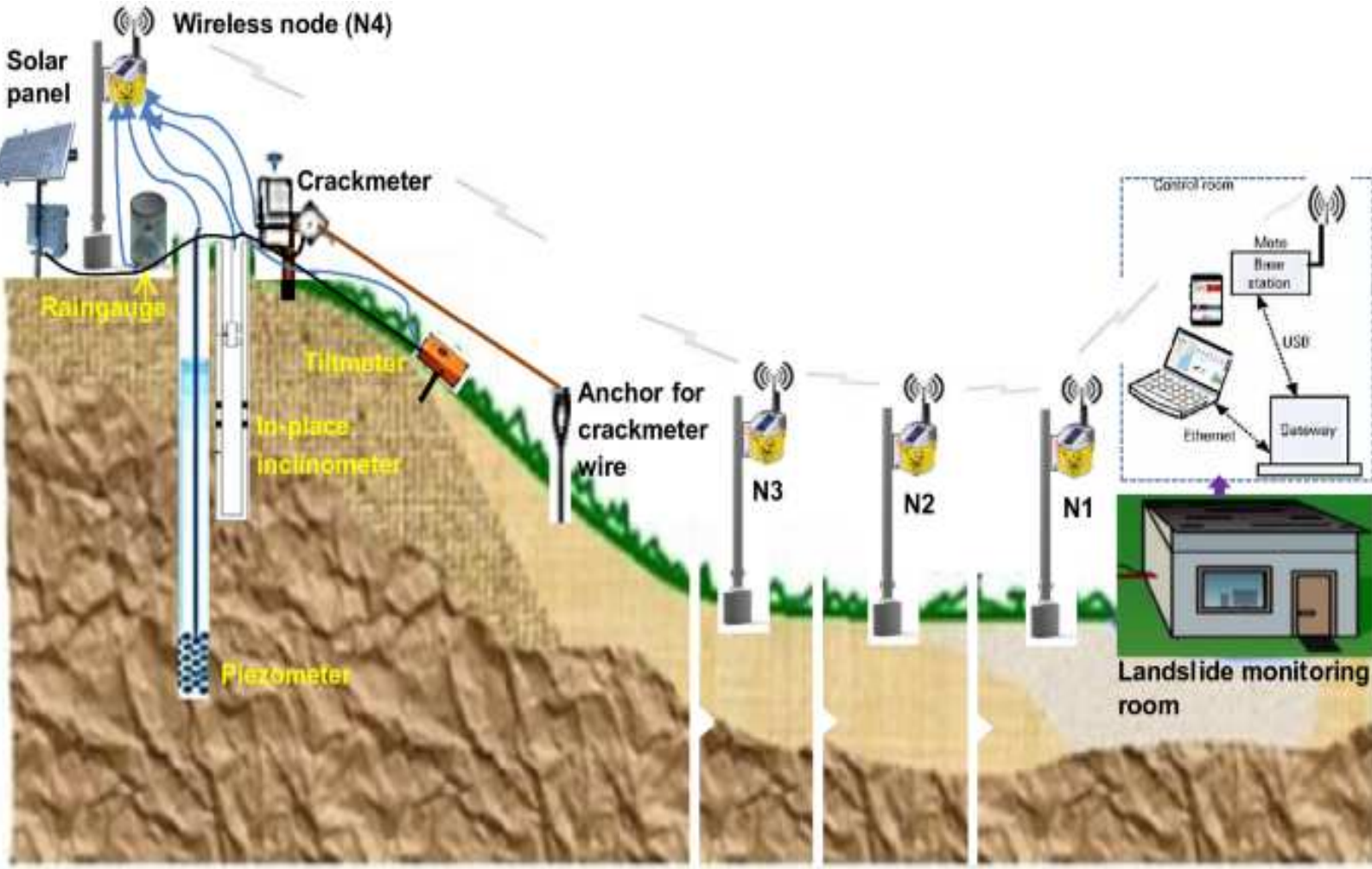
- Help communities identify areas at risk and prepare for avalanches, landslides, and soil problems.
- Set up systems to warn people early and teach them how to stay safe.
- Work with locals to protect the land and prevent soil problems.
- Give support to strengthen buildings and barriers in places where disasters might happen.
- Teach people how to protect their environment and reduce the chance of disasters.

National Academia Input
Area Academia, Think Tanks

- Research causes of avalanches, landslides, and soil degradation in Pakistan.
- Improve early warning systems and disaster monitoring.
- Collaborate on risk reduction strategies with government and communities.
- Educate public on safety measures through campaigns and workshops.
- Promote interdisciplinary collaboration for effective solutions.

International Academia Input
Area Academia, Think Tanks

- Research causes of avalanches, landslides, and soil degradation.
- Innovate early detection technologies for natural hazards.
- Guide government and communities on risk assessment and mitigation.
- Encourage community and volunteer involvement in disaster preparedness.
- Promote collaboration and knowledge-sharing among academia, think tanks, and stakeholders to develop holistic approaches for integrated disaster management.



National Academia Input

Local Media and Early Warning Center

- Disseminate timely and accurate information about potential avalanches, landslides, and soil degradation through various media channels to raise awareness among the public.
- Collaborate closely with meteorological departments and geological agencies.
- Establish community-based reporting systems to encourage citizens to report suspicious activities.

International Academia Input

Local Media and Early Warning Center

- Organize regular drills and training sessions in partnership with local authorities to ensure communities are well-prepared to respond effectively to avalanches, landslides, and soil degradation emergencies.
- Organize practice sessions with local authorities to help communities get ready.
- Conduct public education campaigns to educate communities.

National Academia Input
Search & Rescue, Law Enforcement

- Conduct regular training exercises to enhance search and rescue skills specific to avalanches, landslides, and soil degradation scenarios.
- Collaborate closely with local communities.
- Conduct regular training exercises.
- Establish specialized teams equipped with necessary gear and vehicles for rapid response to natural disasters in remote or inaccessible areas.

International Academia Input
Search & Rescue, Law Enforcement

- Establish specialized search and rescue teams trained specifically for avalanches, landslides, and soil degradation emergencies.
- Deploy advanced technology such as drones, satellite imagery, and GPS tracking to enhance search and rescue operations in challenging terrain.
- Implement efficient coordination mechanisms among various stakeholders.

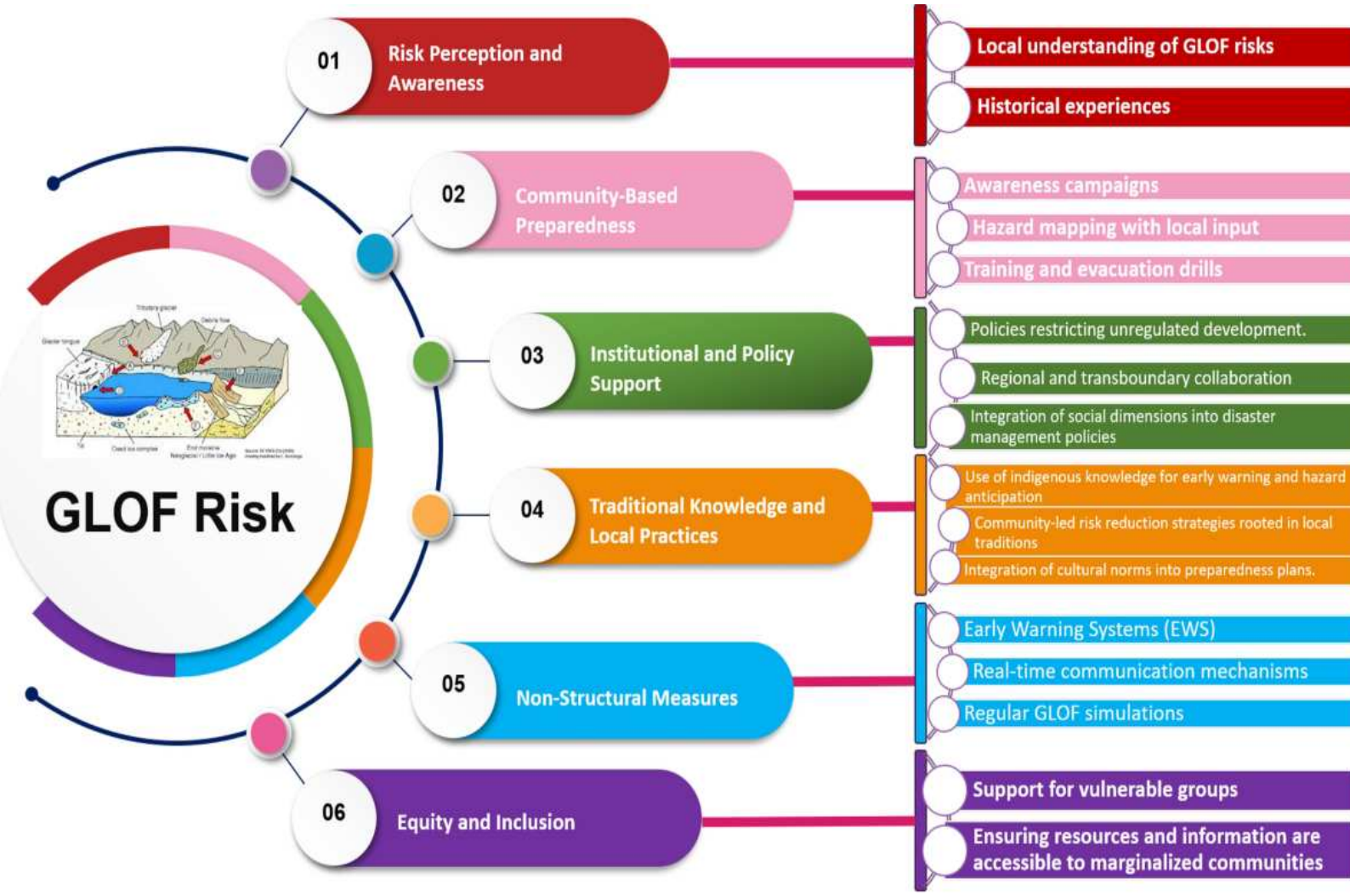
(e) Contingency – Glacial Lake Outburst Flood (GLOF)

National Academia Input
Individual & Community Level

- Establish and maintain simple community-based early warning systems.
- Stay updated with official information regarding GLOF risks.
- Document and share traditional risk mitigation knowledge, experiences, and cultural practices.
- Involve community leaders, schools, religious institutions, and local organizations in spreading information, increasing awareness, and encouraging participation in risk reduction efforts.
- Engage youth through educational programs to raise awareness about GLOFs.
- Stock essential supplies and develop a family emergency plan. Stay informed during and after the event.

International Academia Input
Individual & Community Level

- Utilize bioengineering techniques such as planting trees and creating vegetation barriers.
- Prepare a well-stocked emergency kit including non-perishable food, water, first-aid supplies, medications, sanitation items, flashlight, warm clothing, and important documents.
- Advocate for sustainable land use practices to mitigate risks.
- After a GLOF event, communities can aid in search and rescue efforts using local knowledge to guide emergency responders.
- Implement culturally sensitive approaches in disaster response.
- Pay attention to early warnings and adhere to evacuation plans.



National Academia Input

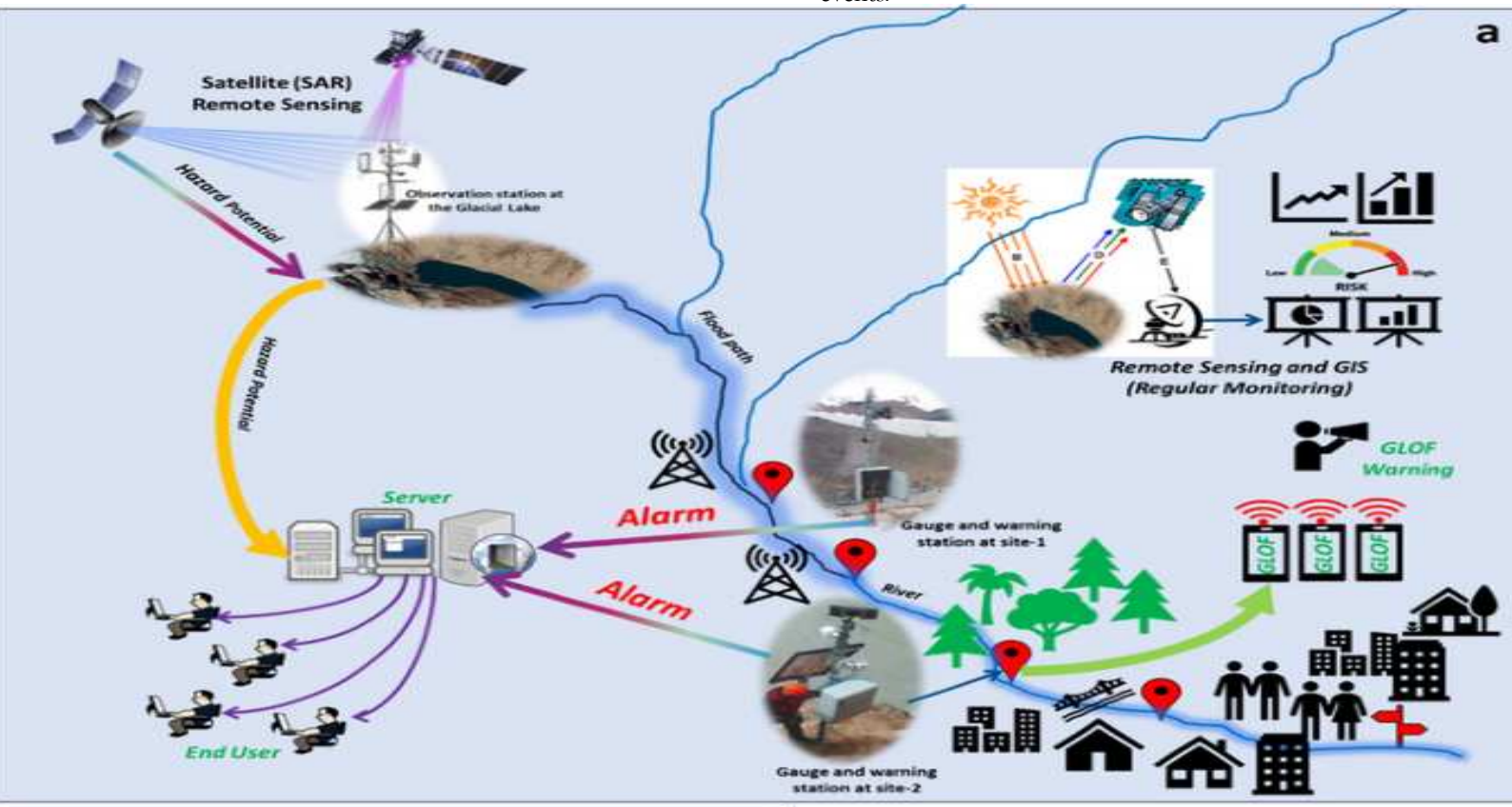
Area Governance

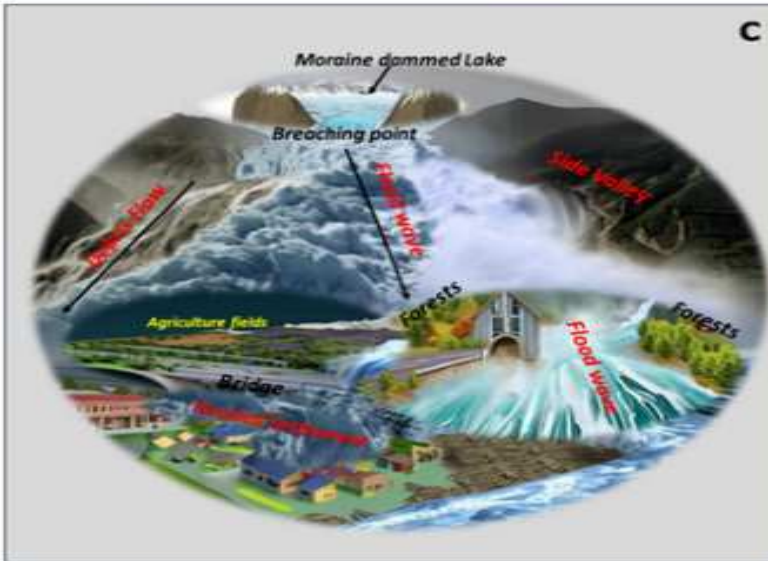
- Enforce and enhance regulations for construction and development in high-risk disaster zones.
- Install early warning systems and glacier cameras, using advanced modeling for real-time data and accurate GLOF prediction.
- Implement community-based approaches for GLOF risk mitigation, focusing on community engagement and awareness.
- Invest in infrastructure projects like flood protection walls, diversion channels, and debris flow barriers to safeguard communities.

International Academia Input

Area Governance

- Advocate for ecosystem-based adaptation strategies like afforestation and sustainable land management to decrease GLOF risks.
- Construct protective barriers such as dams, dykes, and deflection walls to control or redirect GLOF surges, but with careful consideration of environmental and social impacts.
- Support initiatives like avalanche harvesting and artificial glaciers for water scarcity solutions.
- Collaborate with other nations to share knowledge, resources, and best practices for improved preparedness and response to GLOF events.



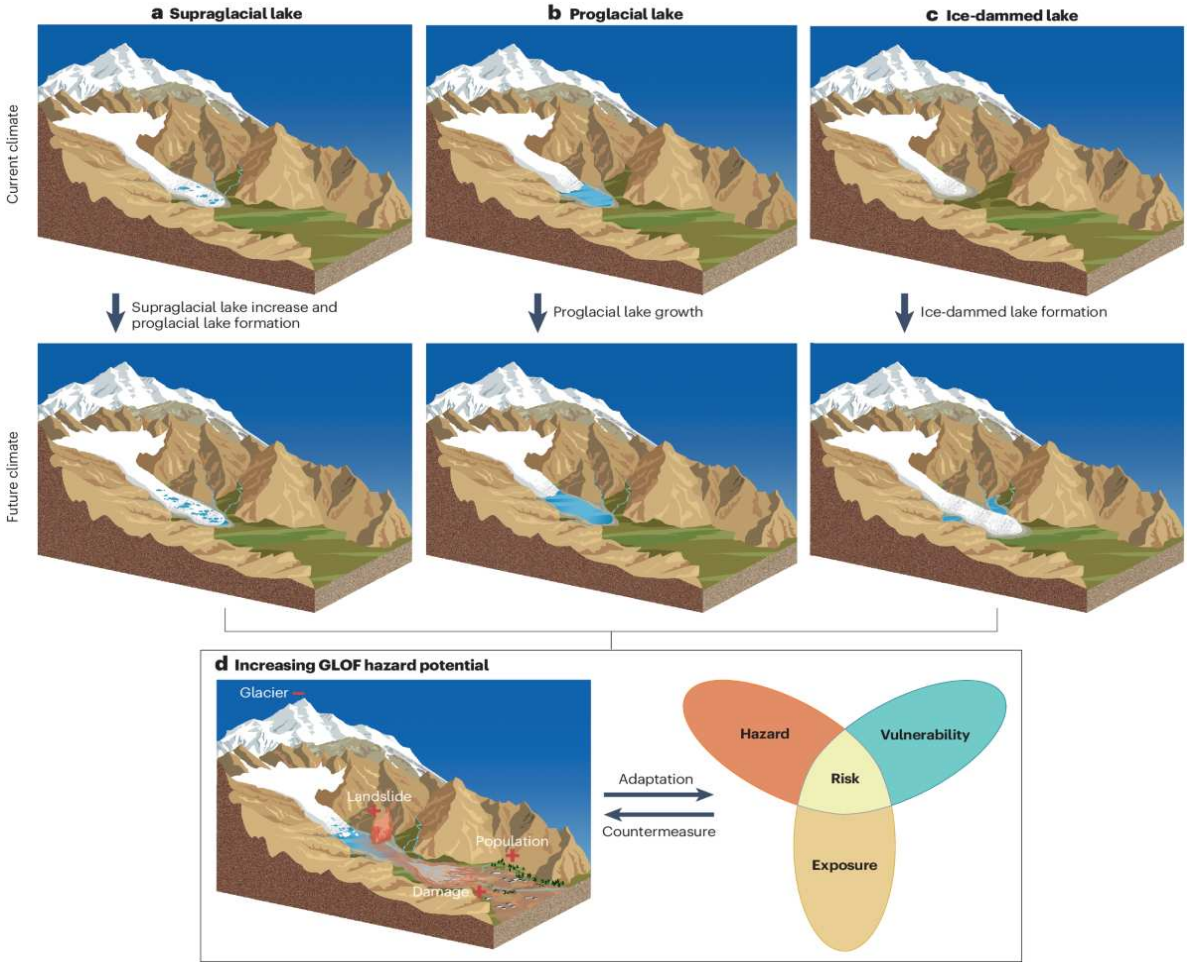


National Academia Input
Role of Federal Organizations

- Establish legislation and policy frameworks to guide GLOF risk management.
- Facilitate collaboration among government agencies, NGOs, research institutions, and communities to address GLOF challenges.
- Collaborate with neighboring countries, such as Nepal, India, and Bhutan, on transboundary GLOF risk management initiatives, data sharing, joint monitoring efforts, and emergency response coordination to address shared risks effectively.
- Support scientific research, data collection, and innovation initiatives aimed at improving understanding of GLOF dynamics, developing new technologies for early warning systems, and implementing innovative solutions for risk reduction and disaster management.
- Train and equip first responders with the necessary skills and resources to conduct search and rescue operations during floods.

International Academia Input
Role of Federal Organizations

- Create and enforce policies for GLOF risk reduction, disaster management, and climate adaptation.
- Execute infrastructure projects to mitigate GLOF impacts.
- Share knowledge, resources, and best practices for effective risk management.
- Establish all-weather shelters with basic necessities for affected communities.



National Academia Input
Private Sector and Local Industry Role

- Create partnerships for risk management and continuity planning, emphasizing collaboration with the public sector and joint contingency plans.
- Execute initiatives by governments to fund and facilitate private sector involvement in disaster management, leveraging digital technologies and financial services.
- Share expertise between companies, governments, and research institutions to enhance early warning systems using sensor technology, data analytics, and communication systems.
- Establish collaborative frameworks for developing and deploying advanced and affordable early warning systems.

International Academia Input
Private Sector and Local Industry Role

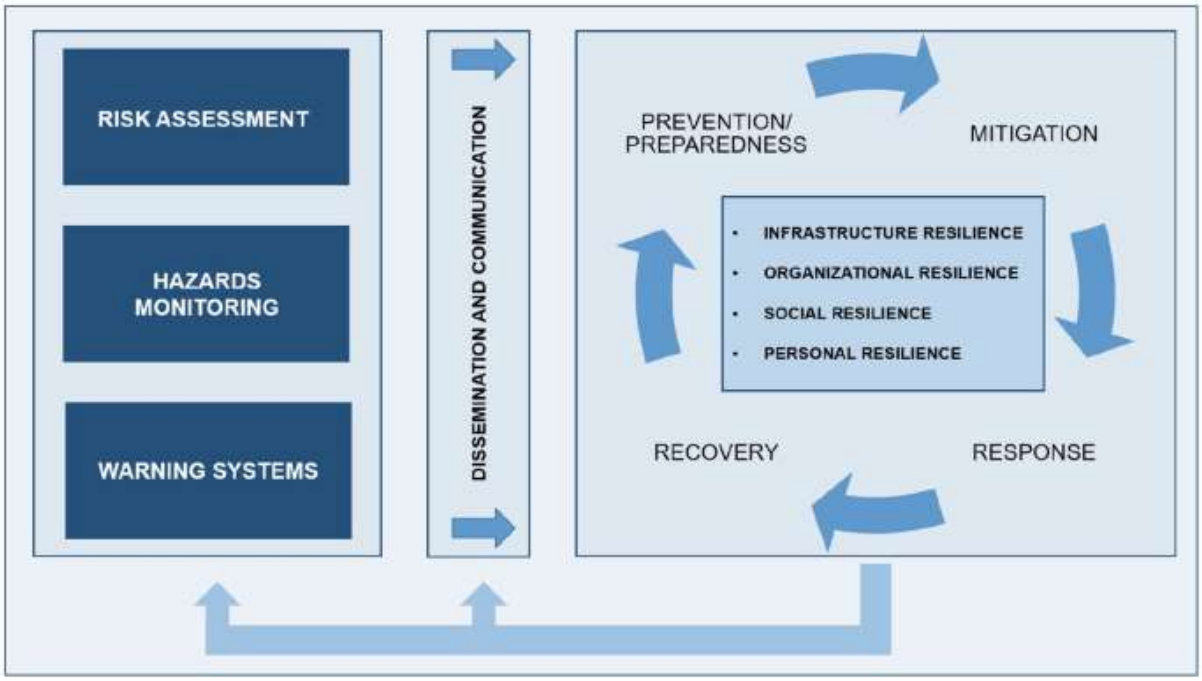
- Create opportunities for early engagement with the private sector to enhance preparedness, emphasizing the benefits of timely involvement for efficient response and resource utilization.
- Execute strategies to promote strong partnerships with the private sector before crises occur, as recommended by experts (Hanna, Stroman, Warden).
- Share resources and support from the public sector to leverage private-sector strengths in areas crucial for preparedness, such as health systems components and logistics.
- Establish collaborative frameworks that recognize and utilize the core capacities of the private sector in disaster preparedness and response efforts.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Create and distribute educational materials like brochures, posters, and videos in local languages to raise awareness about GLOFs and safety measures.
- Execute support for community-based initiatives aimed at GLOF risk reduction and preparedness.
- Share advocacy efforts for infrastructure development to enhance resilience and response capabilities in GLOF-prone areas.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Promote gender equality and inclusion through initiatives and programs.
- Advocate for policy engagement and development to address GLOF challenges.
- Establish strategies for building resilient communities in GLOF-prone areas.
- Support research and development efforts focused on GLOF risk reduction and mitigation.



National Academia Input
Area Academia, Think Tanks

- Document, review, and promote traditional knowledge for enhancing infrastructure resilience, especially in rural housing.
- Advocate for policy changes at local, national, and international levels to address GLOFs, raising awareness in the process.
- Conduct research to develop practical solutions and inform policy decisions related to GLOF risk reduction.
- Collaborate on training programs for stakeholders and policymakers to improve preparedness and response strategies.

International Academia Input
Area Academia, Think Tanks

- Develop and deliver educational programs and courses about GLOFs for students, policymakers, and the public.
- Publish research findings, organize conferences, workshops, and engage in knowledge exchange with various stakeholders.
- Collaborate across academic disciplines like engineering, geology, geography, and social sciences for a comprehensive approach to understanding GLOFs.
- Combine academic expertise with the policy-oriented focus of think tanks to address GLOF challenges effectively.

National Academia Input
Local Media and Early Warning Center

- Raise awareness through local media about GLOFs and their impacts.
- Hold authorities accountable for implementing effective early warning systems (EWS).
- Facilitate communication between stakeholders to ensure timely and accurate information sharing.
- Use multiple monitoring methods in the EWS for comprehensive coverage and reliability.
- Incorporate real-time sensor data and meteorological information for precise and timely warnings.
- Involve local communities in evacuation procedures through drills and awareness campaigns.

International Academia Input
Local Media and Early Warning Center

- Ensure media outlets prioritize accuracy and verified information, avoiding sensationalism.
- Emphasize facts and expert opinions from credible sources like scientists and emergency management officials.
- Maintain and test EWS infrastructure and communication channels regularly for functionality.
- Evaluate and update the EWS based on past events and technological advancements.
- Communicate warnings in local languages for broader community understanding.

National Academia Input
Search & Rescue, Law Enforcement

- SAR teams should have specialized training in flood rescue techniques, including swift water rescue, confined space rescue, and first aid.
- Close collaboration is crucial with other emergency response teams, including law enforcement, medical personnel, and volunteers.
- Communicate clearly and effectively with the public, providing updates on the situation and instructions for evacuation and safety.
- Interact with communities and provide support to ensure their needs are met.
- Collaborate effectively with other emergency response teams, including SAR, medical personnel, and volunteers.

International Academia Input
Search & Rescue, Law Enforcement

- Utilize appropriate equipment for flood rescue operations, such as personal flotation devices, ropes, boats, and advanced communication devices.
- Always prioritize the safety of SAR personnel while conducting rescue operations.
- Uphold human rights and ensure fair and respectful treatment of individuals affected by the disaster.
- Document the event, including damage assessment and evidence collection, for potential investigations and future disaster preparedness planning.

(f) Contingency – Ecosystem Imbalance, Degradation of Forests

National Academia Input
Individual & Community Level

- Indigenous fire management
- Communities harvest resources like firewood and non-timber forest products (NTFPs) selectively and sustainably, ensuring long-term availability.
- Communities designate specific areas as sacred groves or community forests, protecting them from deforestation and promoting biodiversity.
- Communities utilize sustainable resources like bamboo and other forest products to create handicrafts, generating income and promoting cultural heritage.

International Academia Input
Individual & Community Level

- Communities work with government agencies and NGOs to develop joint management plans for forests, ensuring their voice is heard in decision-making.
- Communities establish nurseries to propagate native tree species and participate in reforestation efforts to restore degraded areas.
- Communities develop ecotourism businesses that generate income while promoting sustainable practices and protecting the environment.
- Communities share best practices and learn from each other's experiences in managing their natural resources.

National Academia Input
Area Governance

- Land Use Planning and Zoning
- Participatory Risk Assessments
- Empowering Local Institutions
- Joint Development of Management Plans

International Academia Input
Area Governance

- Aligning Local Policies with National and International Agreement
- Exploring Innovative Financing Mechanisms
- Investing in Green Infrastructure
- Developing and Enforcing Clear Regulations

National Academia Input
Role of Federal Organizations

- Developing national strategies and action plans
- Integrating GLOFs and forest loss into national disaster risk reduction frameworks
- Conducting national-level risk assessments
- Facilitating access to technology
- Investing in research and development

Milestone	Biodiversity and Ecosystem Services Local institutions & networks engaged in up-scaling integrated management of biodiversity	
	2012-2016	2017-2022
Empowerment & Mobilization of Local Institutions & Networks	71	85

International Academia Input
Role of Federal Organizations

- Providing funding for local initiatives
- Providing technical assistance
- Engaging in international agreements
- Supporting regional initiatives
- Participation in the International Centre for Integrated Mountain Development (ICIMOD)

National Academia Input
Private Sector and Local Industry Role

- Invest in green and resilient infrastructure
- Invest in sustainable forestry practices within their own concessions
- Provide fair compensation for ecosystem service.

International Academia Input
Private Sector and Local Industry Role

- Collect timber and other resources from certified sustainable forests
- Companies with expertise in relevant technologies can partner with governments and NGOs to develop and maintain early warning systems for GLOFs. This can help save lives and minimize property damage in case of an event.
- Invest in community-based conservation initiatives

IUCN

International Union for Conservation of Nature

ISSUES BRIEF

FEBRUARY 2021

DEFORESTATION AND FOREST DEGRADATION

- Deforestation and forest degradation are the biggest threats to forests worldwide.
- Over half of the tropical forests worldwide have been destroyed since the 1960s, and every second, more than one hectare of tropical forests is destroyed or drastically degraded.
- The degradation and loss of forests threatens the survival of many species, and reduces the ability of forests to provide essential services.
- Deforestation and forest degradation impact the lives of 1.6 billion people whose livelihoods depend on forests. One billion of them are among the world's poorest.
- Nature-based solutions such as forest landscape restoration (FLR) can reverse the effects of deforestation and degradation and regain the ecological, social, climatic and economic benefits of forests.

What is the issue?

Deforestation and forest degradation are the biggest threats to forests worldwide. Deforestation occurs when forests are converted to non-forest uses, such as agriculture and road construction. Forest degradation occurs when forest ecosystems lose their capacity to provide important goods and services to people and nature.

Over half of the tropical forests worldwide have been destroyed since the 1960s, and every second, more than one hectare of tropical forests is destroyed or drastically degraded. This intense and devastating pressure on forests is not limited to the tropics – an estimated 3.7 million hectares of Europe's forests are damaged by livestock, insects, diseases, forest fires, and other human-linked activities.

Deforestation in Myanmar. Photo: Li Jia/IUCN

Why is this important?

Biodiversity

Over 80% of the world's terrestrial biodiversity can be found in forests - from pine trees in the boreal North to the rainforests in the tropics. The degradation and loss of forests threaten the survival of many species, and reduce the ability of forests to provide essential services such as clean air and water, healthy soils for agriculture, and climate regulation.

Sustainable livelihoods

Healthy forests support the livelihoods of 1.6 billion people globally, one billion of whom are among the world's poorest. Deforestation and forest degradation have real and tangible impacts on the lives of these vulnerable communities. For example, 52 per cent of all land used for food production is moderately or severely impacted by the erosion of healthy soil. This occurs when trees are removed from a landscape, leading to increased food insecurity.

Climate mitigation and adaptation

The world's forests absorb 2.4 billion tonnes of carbon dioxide (CO_2) per year, one-third of the annual CO_2 released from burning fossil fuels. Forest destruction emits further carbon into the atmosphere, with 4.3–5.5 $GtCO_2e$/yr generated annually, largely from deforestation and forest degradation. Protecting and restoring this vast carbon sink is essential for mitigating climate change.

Forests also play a crucial role in climate change adaptation efforts. They act as a food safety net during climate shocks, reduce risks from disasters like coastal flooding, and help regulate water flows and microclimates. Improving the health of these forest ecosystems and introducing sustainable management practices increase the resilience of human and natural systems to the impacts of climate change.

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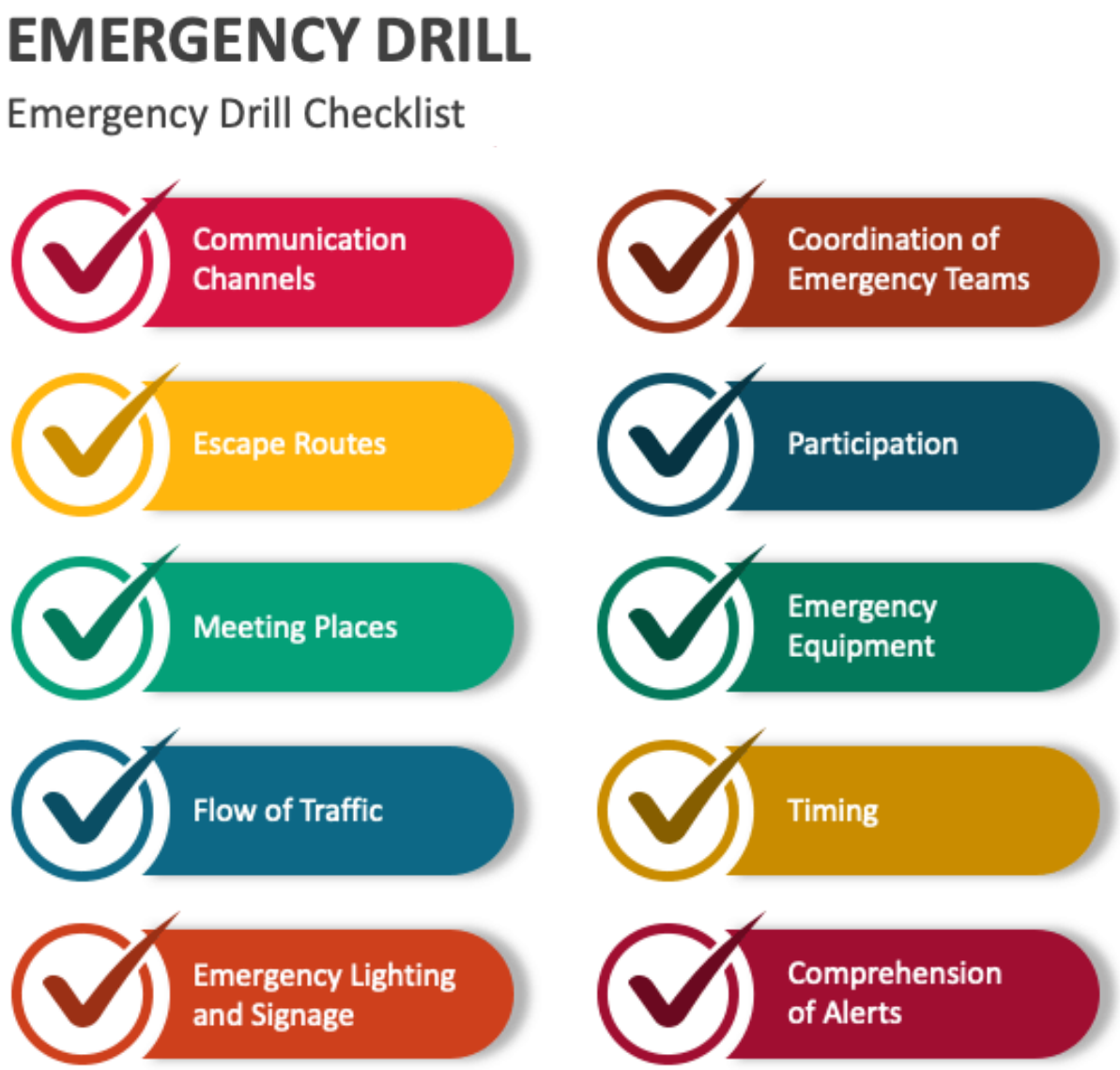
National Academia Input
NGOs, Humanitarian Resource Enablers

- Disregard rumors, misinformation, and other false information, which may create confusion in the effectiveness of relief operations.
- Regular drills and simulations allow communities to practice their emergency response plans.
- Build swift and effective responses during actual emergencies.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Effective starting point in DRR education is awareness Campaigns. These campaigns inform the public about the types of disasters they might encounter, the potential consequences, and the actions they should take to stay safe.
- Fundamental hubs for DRR education. By integrating DRR into the curriculum, students not only gain knowledge but also become agents of change within their families and wider communities. School programs can include topics like disaster preparedness, first aid, and environmental conservation, fostering a culture of resilience from an early age.



National Academia Input
Area Academia, Think Tanks

- Where to Look for Information from Pakistani Universities and Research Institutes
- Look for articles about research projects or collaborations between academia and government agencies related to mountain environments or GLOFs in Pakistan.
- Helps in Participatory Forest management
- Data-driven policy recommendations
- Organizing workshops, conferences, and other platforms for dialogue and knowledge sharing among researchers, policymakers, practitioners, and local communities.

International Academia Input
Area Academia, Think Tanks

- Explore and test innovative technologies and approach for monitoring, early warning, and promoting sustainable forest management practices in mountain regions.
- Present research findings and recommendations to policymakers, government agencies, and other stakeholders to inform policy development and decision-making.
- Translate complex scientific data and findings into clear, easily understandable language for policymakers, communities, and the broader public.
- This intergovernmental organization conducts research on various aspects of mountain development, including GLOFs and forest degradation.

National Academia Input
Local Media and Early Warning Center

- Design EWS to address multiple hazards, not just one, as they sometime occur simultaneously or consecutively.
- Combine data from satellites and radar allows for wider coverage and more accurate monitoring of water levels, precipitation, and potential flood risks. This information is crucial for issuing timely and precise flood warnings.
- Use comprehensive approach to ensure preparedness for various scenarios like single-threat warnings addressing earthquakes, floods, typhoons, droughts, and other natural disasters.

International Academia Input
Local Media and Early Warning Center

- Combining data from various sources like rain gauges, river levels, weather forecasts, and ground sensors provides a comprehensive understanding of flood risk.
- Structures are equipped with sensors, monitoring systems, and automated control mechanisms to respond to changing water levels and weather conditions.

National Academia Input
Search & Rescue, Law Enforcement

- Participate in drills and simulations to ensure coordinated and efficient response team.
- Maintain communication networks
- Train SAR personnel
- Locate and rescue survivors

International Academia Input
Search & Rescue, Law Enforcement

- Respond to environmental emergencies
- Search and rescue training for specific ecosystem
- Collect data and collaborate with environmental agencies
- Enforce environmental laws and regulations
- Monitor and patrol protected areas
- Encourage the development and adoption of sustainable certification programs and supply chain procedures for forest products.

(g) Contingency – Wild Fire

National Academia Input
Individual & Community Level

- Promote information initiatives tailored to local contexts, enhancing credibility and relevance.
- Cultivate a culture of cooperation and inclusivity within Joint Forest Management Committees (JFMCs) to support adjacent forest communities.
- Increase awareness of forest fire laws and legislation.
- Promote open communication among neighbors to address concerns and improve understanding of fire risks.
- Emphasize the importance of social interactions in fostering a sense of community attachment.
- Enhance the Integrated Forest Fire Management (IFFM) concept through increased community participation.

International Academia Input
Individual & Community Level

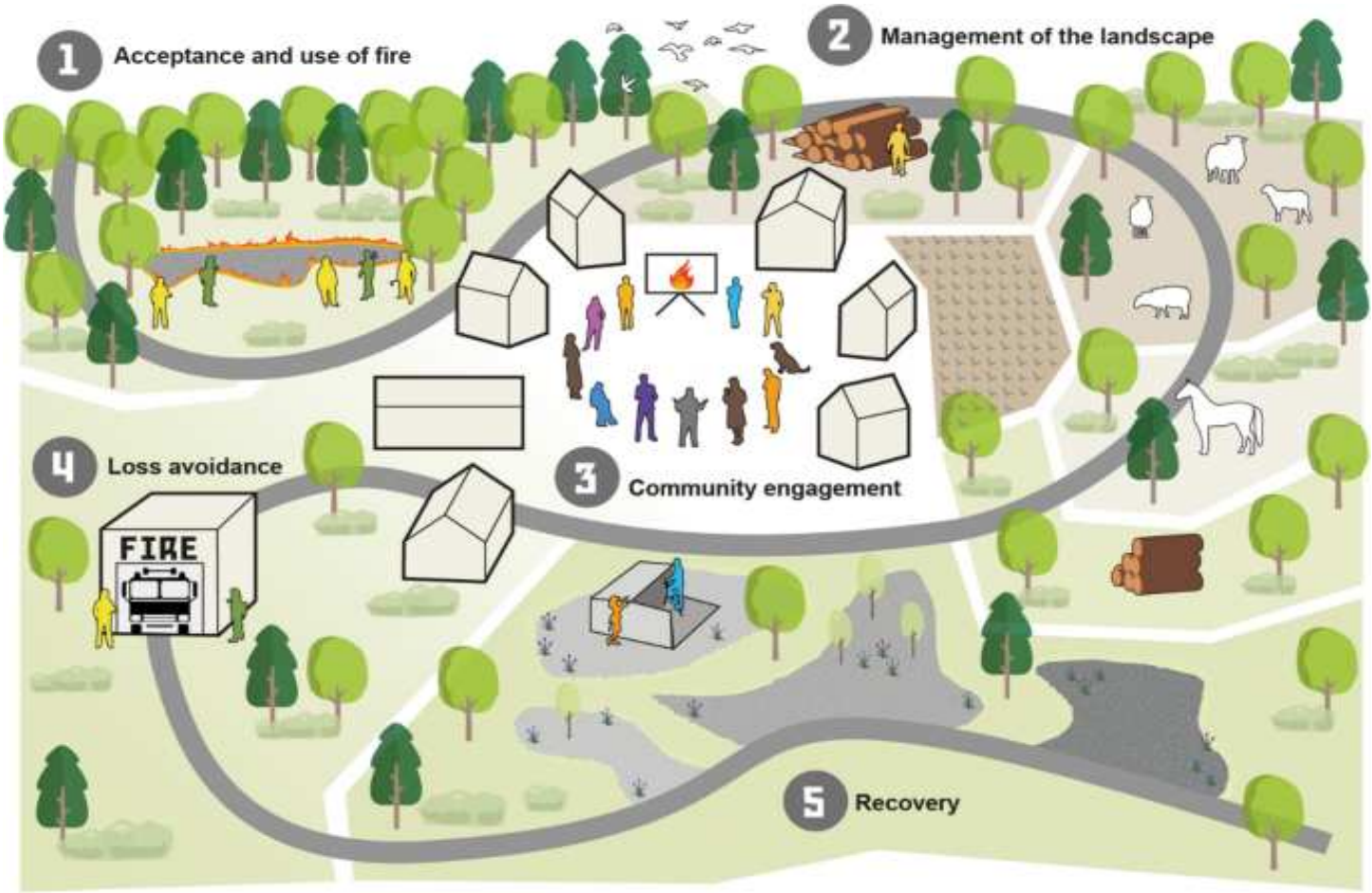
- Promote interactive communication is crucial during fires, especially for the individuals who are most impacted.
- Raise awareness about the immediate and indirect effects of forest fires on communities.
- Raise awareness of communities' role and responsibilities in forest fire management.
- Actively participate in forest fire prevention and suppression actions.
- Mandatory evacuation plans can help limit the number of people affected by wildfires in areas where they are more likely to occur.
- The forest Fire Prevention Training Module should be replicated in Pakistan as introduced by Indonesia.

National Academia Input
Area Governance

- Use the collected data through the daily reporting system (DSRs) to conduct a thorough study and detect trends in forest fires, such as frequency, severity, causes, and affected areas.
- Conduct detailed assessments to determine which plant species are prone to igniting fires. Remove these plants from high-risk regions to lessen the likelihood of wildfires.
- Increase enforcement methods to ensure compliance with the restriction on forbidden activities and products in forest fire zones.
- Implement the Fire Incidents Rapid Response Team (FIRRT) approach, which can reduce the damaging effects of forest fires.

International Academia Input
Area Governance

- Governments should invest in fire suppression and efforts to avert wildfires, such as cutting fuel loads and re-establishing natural fire cycles in ecosystems.
- Implement the proven practices and tools such as fire monitoring watch towers and early detection, fire danger rating, and asset vulnerability management through buffer zones and the adoption of codes.
- Encourage to support the formation and strengthening of Fire Protection Associations as a crucial instrument for wildfire management and risk reduction.
- Attempt to lessen the risk wildfires cause to people and structures, is one important wildfire initiative in Canada.

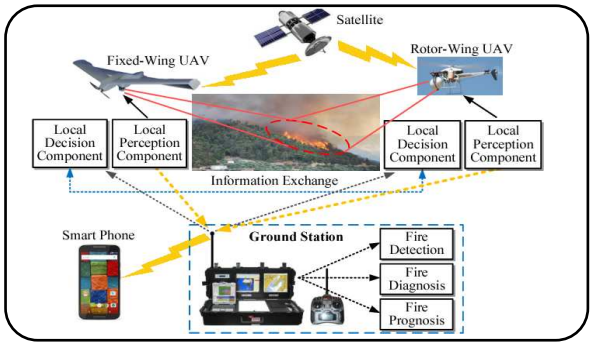


National Academia Input
Role of Federal Organizations

- Support sustainable forest management practices that strike a balance between economic, environmental, and social goals.
- The government should confirm its commitment to increasing the tree-to-person ratio in Pakistan.
- Adopt performance-based designs, fire risk education, and self-protection measures which are necessary guidelines to mitigate the damaging effects of forest fire.
- Guarantee the provision of qualified staff in fire safety and protection to all Pakistani forested areas.
- Implement all the plans and strategies related to fire on time, which can be highly effective.

International Academia Input
Role of Federal Organizations

- Use drones to track fire activity, computer models to forecast fire behavior, and satellite data to identify flames.
- Establish and maintain fuel management zones around communities, infrastructure, and high-risk wildfire areas.
- Adopt Wildfire Prevention Action Plan which includes feedback from a range of stakeholders and lessons learnt.
- The government should endorse the construction of complete standards for emergency shelters, guaranteeing that they are properly outfitted with basic facilities.



National Academia Input
Private Sector and Local Industry Role

- Insurance companies should promote fire safety guidelines.
- Advanced technology for early detection and monitoring of forest fires can be developed and used by private enterprises.
- Businesses in sectors including construction, agriculture, and forestry can implement sustainable supply chain strategies to reduce the likelihood of forest fires.
- Private sector should invest in the environmental conservation initiatives.

International Academia Input
Private Sector and Local Industry Role

- Promote usage of forest wildfire detection systems.
- Contribute to the fight against fuel through brush removal, forest thinning, and vegetation management techniques in the sectors like logging, agriculture, and land development
- Local enterprises should supply trained individuals, machinery, and equipment to aid in the fight against fires during wildfire events.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Create framework, like "Pakistan Wildfire Framework," to combine AI techniques with existing forest fire management procedures.
- Encourage practices of forestation and sustainable management that increase carbon sequestration while mitigating the consequences of climate change. For example, Programmatic Approach on Forest Management in South Asia (PROFOR).

International Academia Input
NGOs, Humanitarian Resource Enablers

- Apply of science-based methods for wildfire control and mitigation.
- Collaborate with local, state, and international organizations to add value in forest fire risk management cycle.

National Academia Input
Area Academia, Think Tanks

- Provide firefighters with critical situational knowledge even in unexpected locations.
- The likelihood of fire-related tragedies in urban environments can be significantly decreased by addressing fire threats at their source.
- Engage in genuine communication with indigenous people to better understand their viewpoints and needs.

International Academia Input
Area Academia, Think Tanks

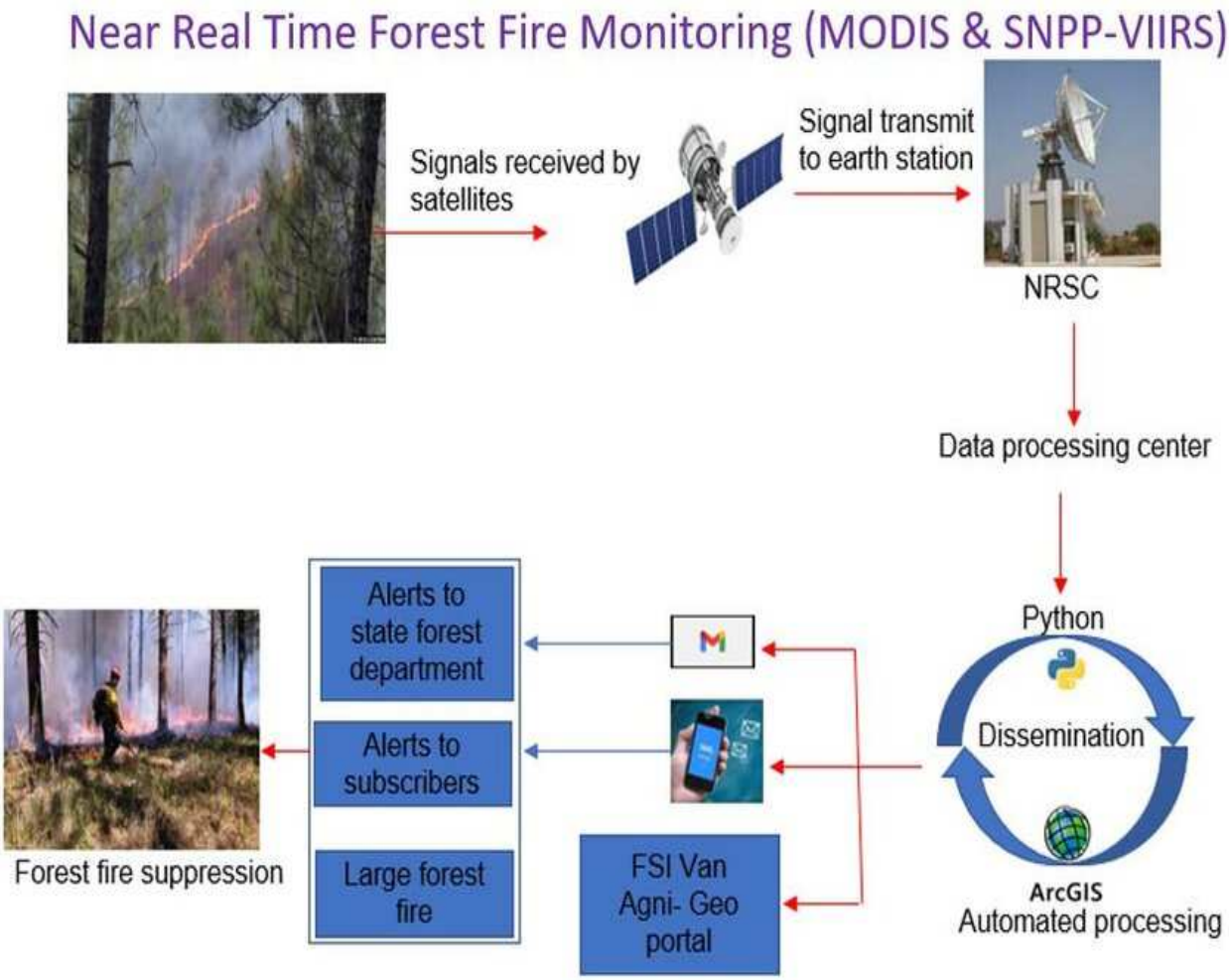
- Provide data-driven insights to support future urban planning initiatives and provide better infrastructure for emergency response teams.
- Advocate in policies for risk minimization and intersectoral cooperation are part of regional fire management strategies. For example, significant expenditures on firefighting and fire threat predictions.
- Penalties should be applied to individuals who intentionally or negligently cause fires.

National Academia Input
Local Media and Early Warning Center

- Forest Fire Management Teams (FFMTs) must be in charge of making sure that all applicable evacuation, communication, and fire safety procedures are carried out.
- Building control regulations must be followed, and buildings must be made accessible to firefighters by allowing room for their mobility throughout construction.
- Create defensible spaces between the building and the vegetation or any wild area that surrounds it.
- Advanced fire detection systems must be used in high-risk regions.

International Academia Input
Local Media and Early Warning Center

- The skidding lanes should be installed in higher-risk places.
- Incorporate pre-established fire control lines, buffer zones (which reduce the amount, kind, and density of vegetation), and other safety precautions.
- Prescribed burning should be used to control vegetation, restore ecological balance, and serve as a teaching and training.
- In order to prevent forest fires, frontier technologies are being used to create detailed geospatial maps.



National Academia Input
Search & Rescue, Law Enforcement

- Provide timely responses to fire situations by efficient dispatch and deployment of Rescue 1122 fire crews.
- Deception and outright theft of forest products should be considered as forestry transaction crimes.
- Use participatory approach in conservation of biodiversity and representative ecosystems which requires a involving all stakeholders.
- Efforts should be made to evaluate the state of the forests, watersheds, and rangelands.
- Local governments must work with water and power companies to build stronger systems to prevent the loss of electricity, heat and running water over longer periods of time.

International Academia Input
Search & Rescue, Law Enforcement

- Deterrence is a key component of law enforcement strategy, with the goal of discouraging potential offenders from committing crimes by increasing the perceived danger of arrest and punishment.
- Good Neighbor Authority (GNA) allows State foresters to help understaffed Federal agencies design forest restoration treatments.
- Wood from western forests can be used and recycled in countless ways while restoring forests to a sustainable condition and reducing wildfire hazard.
- Conduct country's health awareness campaigns and safety precautions for the upcoming forest fire season.

(h) Contingency – Earthquake

National Academia Input
Individual & Community Level

- Individuals and communities from earthquake prone areas of Pakistan can adopt practices such as constructing earthquake-resistant buildings and developing family emergency plans that include evacuation routes and communication protocols.
- Develop and implement educational programs in schools and communities to make citizens aware of earthquake hazards and preparedness actions.
- Establish a line of responsibility and measures to assess the safety of buildings following earthquakes, and decide on evacuation, repair and re-occupancy procedures.
- Pakistan should enact legislation requiring public schools to establish emergency preparedness systems, including disaster plans and preparedness training for both staff and students.

International Academia Input
Individual & Community Level

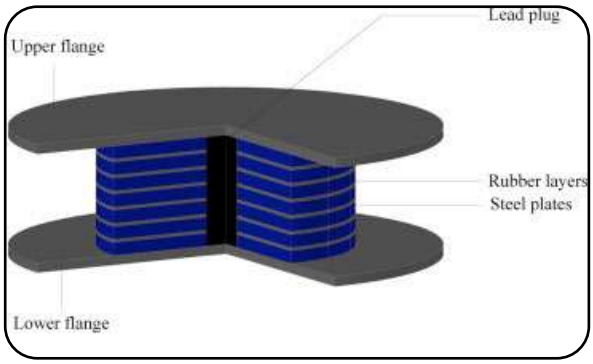
- Identify critical infrastructure elements most susceptible to earthquake damage, like buildings, bridges, power lines, water pipelines, and communication networks.
- Team SAFE-T is grassroots, education-based effort in California to improve school safety and family readiness by making preparedness activities an integral part of the school year.
- Regular building inspection operations are conducted in Japan to avoid the catastrophic impacts of an earthquake.
- Establish emergency preparedness systems, encompassing disaster plans, and preparedness training for both staff and students.

National Academia Input
Area Governance

- Enforce earthquake resistant construction codes and retrofitting protocols for vulnerable buildings, especially critical infrastructure like hospitals, schools, and public buildings in the earthquake prone areas of Pakistan.
- Develop detailed vulnerability maps that pinpoint critical infrastructure elements most susceptible to earthquake damage, considering factors like soil type, track alignment, and bridge design.

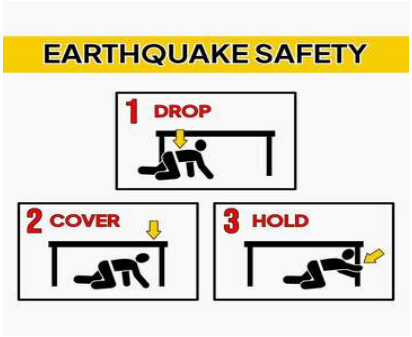
International Academia Input
Area Governance

- Employed seismic retrofitting techniques for existing infrastructure buildings due to its extensive history of earthquakes.
- Retrofitting of existing buildings and infrastructure to improve their seismic resilience. This includes strengthening building structures, reinforcing foundations, and installing seismic isolation and damping systems to reduce the impact of ground shaking during earthquakes.



National Academia Input
Role of Federal Organizations

- Collaborate with provincial and local authorities particularly with the earthquake prone areas to develop and implement comprehensive earthquake risk management plans, incorporating hazard assessments, building codes, and emergency response protocols.
- Ensure the availability of safe and accessible shelters for displaced populations, providing essential services like food, water, sanitation, and healthcare.



International Academia Input
Role of Federal Organizations

- Establish robust seismic monitoring networks, conducting vulnerability assessments of critical infrastructure, and coordinating inter agency exercises and drills to test response capabilities.
- Develop rapid response mechanisms to deploy social workers and volunteers to affected areas immediately after an earthquake.

National Academia Input
Private Sector and Local Industry Role

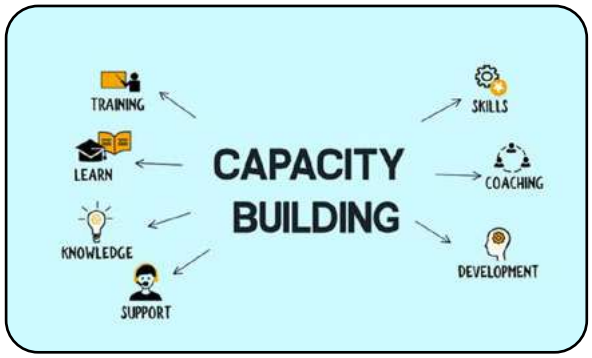
- Produce earthquake resistant building materials that are specifically designed to withstand seismic forces.

International Academia Input
Private Sector and Local Industry Role

- Globally private sector and local industry provide reinforced concrete, steel reinforcement bars, and masonry blocks that meet building codes and standards for seismic construction.

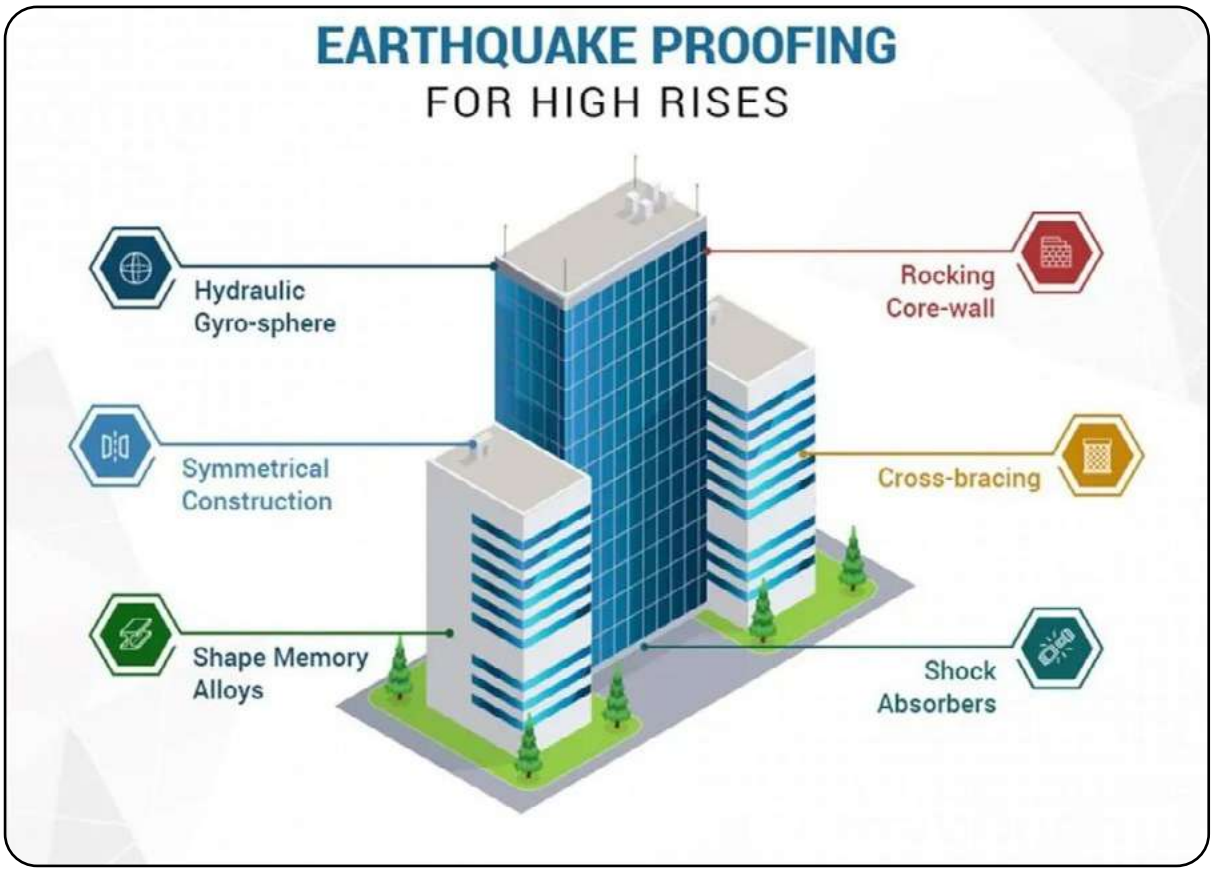
National Academia Input
NGOs, Humanitarian Resource Enablers

- Outline area wise procedures for search and rescue operations, medical aid distribution, damage assessment and resource allocation.
- Outline seismic zone wise procedures for search and rescue operations, medical aid distribution, damage assessment, resource allocation, and communication protocols in the aftermath of an earthquake.
- Create easy-to-understand content in local languages, such as brochures, posters, and videos, to convey crucial information about earthquake preparedness.



International Academia Input
NGOs, Humanitarian Resource Enablers

- Work with local communities and authorities to identify areas most vulnerable to earthquakes consider factors like housing quality, infrastructure access, and population density.
- Development of a clear and practical plan setting out roles, responsibilities and processes for carrying out initial damage assessment immediately following a major earthquake, and communicate the plan to all who will have a role in damage assessment.
- Use visual aids such as illustrations, diagrams, and infographics to supplement written content and enhance understanding, mainly for individuals with low literacy level.
- Build trust and partnerships with local communities through participatory risk assessments, awareness campaigns, and capacity-building workshops.



National Academia Input
Area Academia, Think Tanks

- Conduct comprehensive seismic hazard mapping including active fault zones, and regions with high seismic risk and assess potential impacts on infrastructure, communities, and ecosystems.
- Train and equip researchers, disaster management personnel, and University students with the necessary skills and knowledge to effectively manage earthquake risks.
- Include lessons in science, geography and social studies, to teach about earthquake science, risk assessment, disaster management, and community resilience.

International Academia Input
Area Academia, Think Tanks

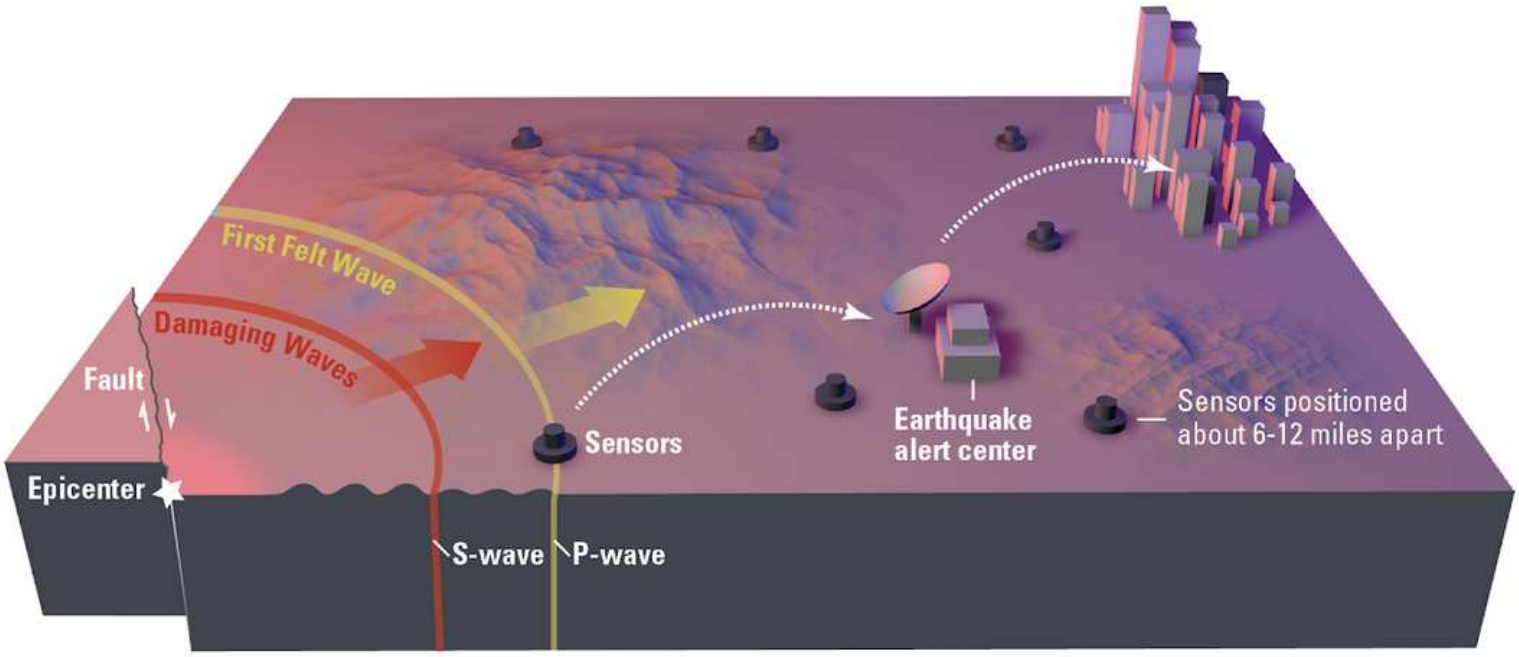
- Conduct comprehensive seismic hazard mapping to identify areas prone to earthquakes, including active fault zones, subduction zones, and regions with high seismic activity. These maps are regularly updated based on the latest scientific research and data.
- Academic institutions should conduct extensive research to analyze past earthquakes, monitor current seismic activity, and develop predictive models.
- Conduct earthquake awareness training programs to educate students about the risks associated with earthquakes and preparing them to respond effectively in case of an earthquake.

National Academia Input
Local Media and Early Warning Center

- Establishment of a robust network of unities seismic sensors strategically placed across the country to detect seismic waves and trigger timely alerts to at risk communities and authorities
- Development and dissemination of earthquake awareness campaigns in regional languages for maximum reach and effectiveness.

International Academia Input
Local Media and Early Warning Center

- Develop a seismic monitoring and early warning system like J-Alert which aims to provide rapid and accurate alerts to individuals, communities, and organizations across Japan in the event of an earthquake, allowing for timely response and mitigation efforts.
- Launch comprehensive public awareness campaigns to educate citizens about earthquake safety, preparedness measures, and early warning systems.



National Academia Input
Search & Rescue, Law Enforcement

- Assigning responsibility for maintaining a business continuation planning program and establishing accountability for success.
- Implement earthquake resistant design standards for new construction projects, incorporating features like seismic isolation bearings, ductile materials, and redundant communication channels.
- Develop comprehensive disaster plans for schools involving various stakeholders

International Academia Input
Search & Rescue, Law Enforcement

- Assess the earthquake-resistance performance of houses across three levels, these indices serve as key metrics for evaluating the structural integrity and resilience of buildings against seismic events.
- Enhance building standards and promoting seismic resilience in communities prone to earthquakes.
- Build building codes which includes, ground motion activity, collapse prevention and structural damage, secondary effect (tsunamis, landslides, etc.) and socio-economic impact to the community
- School awareness materials should be provided to all citizens.

(i) Contingency – Epidemics, Vector Borne Diseases

National Academia Input
Individual & Community Level

- Key interventions like Insecticides-Treated Nets (ITNs), Indoor Residual Spraying (IRS), Larval Source Management (LSM), and Fogging operations are vital for vector control, preventing disease spread, and reducing health and economic impacts.
- Establish district health committees with empowered community engagement and conduct community-friendly awareness campaigns to ensure greater accountability to affected communities.

International Academia Input
Individual & Community Level

- Incorporate biocontrol agents like parasites, entomopathogens, predators, and parasitoids into breeding areas for effective vector management.
- Engage local communities through forums, educational campaigns, and health literacy initiatives to enhance understanding of epidemics, transmission pathways, preventive measures, and early symptom reporting significance.

National Academia Input
Area Governance

- District and provincial governments should ensure 100% vaccination coverage among target groups.
- District Administrations must guarantee regular cleaning and maintenance of water supply lines.

International Academia Input
Area Governance

- Embrace the Integrated Approach for Sustainable Management of Vector-Borne Diseases (VBDs) to develop a comprehensive strategy integrating various interventions with other disease control measures in Pakistan.
- Ensure regular disinfection of public spaces including hospitals, labs, dispensaries, public transport, and stations.

National Academia Input
Role of Federal Organizations

- Malaria Control Programs (MCPs) with structured vector control components are operational at national and provincial levels in Pakistan.
- The Directorate of Malaria Control (DoMC) in Pakistan actively manages vector-borne diseases (VBDs) through the formulation of national policies, strategies, guidelines, and surveillance tools.

International Academia Input
Role of Federal Organizations

- Enhance regional monitoring networks, share epidemiological data, and coordinate response efforts for transboundary epidemics affecting semi-desert zones in collaboration with neighboring countries and international organizations.
- Coordination across ministries of sectors, including healthcare, agriculture, academia, and transportation, trade and industry to implement integrated epidemic response plans and to ensure disinfection through UV radiations and sanitizing sprays.

National Academia Input
Private Sector and Local Industry Role

- Need for adaptable funding mechanisms to support malaria and VBDs response efforts across various technical actors engaged in humanitarian emergencies, including local non-governmental organizations and private sector entities.

International Academia Input
Private Sector and Local Industry Role

- Consider adopting multidisciplinary training approaches for health professionals in Pakistan, while extending training to various health worker categories.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Collaborate with NGOs and INGOS for emergency relief efforts in Pakistan.
- Implement flexible funding mechanisms to support malaria and vector-borne disease response efforts during humanitarian emergencies.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Assist in building and enhancing healthcare infrastructure, such as clinics, laboratories, and treatment centers, to enhance healthcare accessibility for communities residing in semi-arid regions.
- Collaborate with local health authorities to establish robust disease surveillance systems, facilitating early detection and response to epidemics and vector-borne diseases through data analysis and information exchange.

National Academia Input
Area Academia, Think Tanks

- Close collaboration among medical doctors, veterinarians, and public health officials is vital for developing predictive disease models, enabling efficient resource allocation in control programs.

International Academia Input
Area Academia, Think Tanks

- Utilize modern technology to improve vector intervention monitoring, such as mobile applications for tracking the distribution of Insecticide-Treated Nets (ITNs), enhancing efficiency and reducing direct personnel contact.

National Academia Input
Local Media and Early Warning Center

- Create flyers to inform the public about the disease and ways to prevent its spread.
- Create a group of skilled master trainers to tackle crises and epidemics.

International Academia Input
Local Media and Early Warning Center

- Utilize Early Warning Systems (EWS) to guide the development of effective vector control programs, including analyzing pathogen spread, monitoring spatial distribution, forecasting infections, and disseminating warnings for prompt response.
- Establishment of quarantine and medical facilities supervised by trained medical care givers and doctors.

National Academia Input
Search & Rescue, Law Enforcement

- Involve of leaders, volunteers, and community-based organizations (CBOs) facilitated improved ownership and sustainability of all dengue prevention activities.
- Establishment of Hospital-Based sentinel sites.

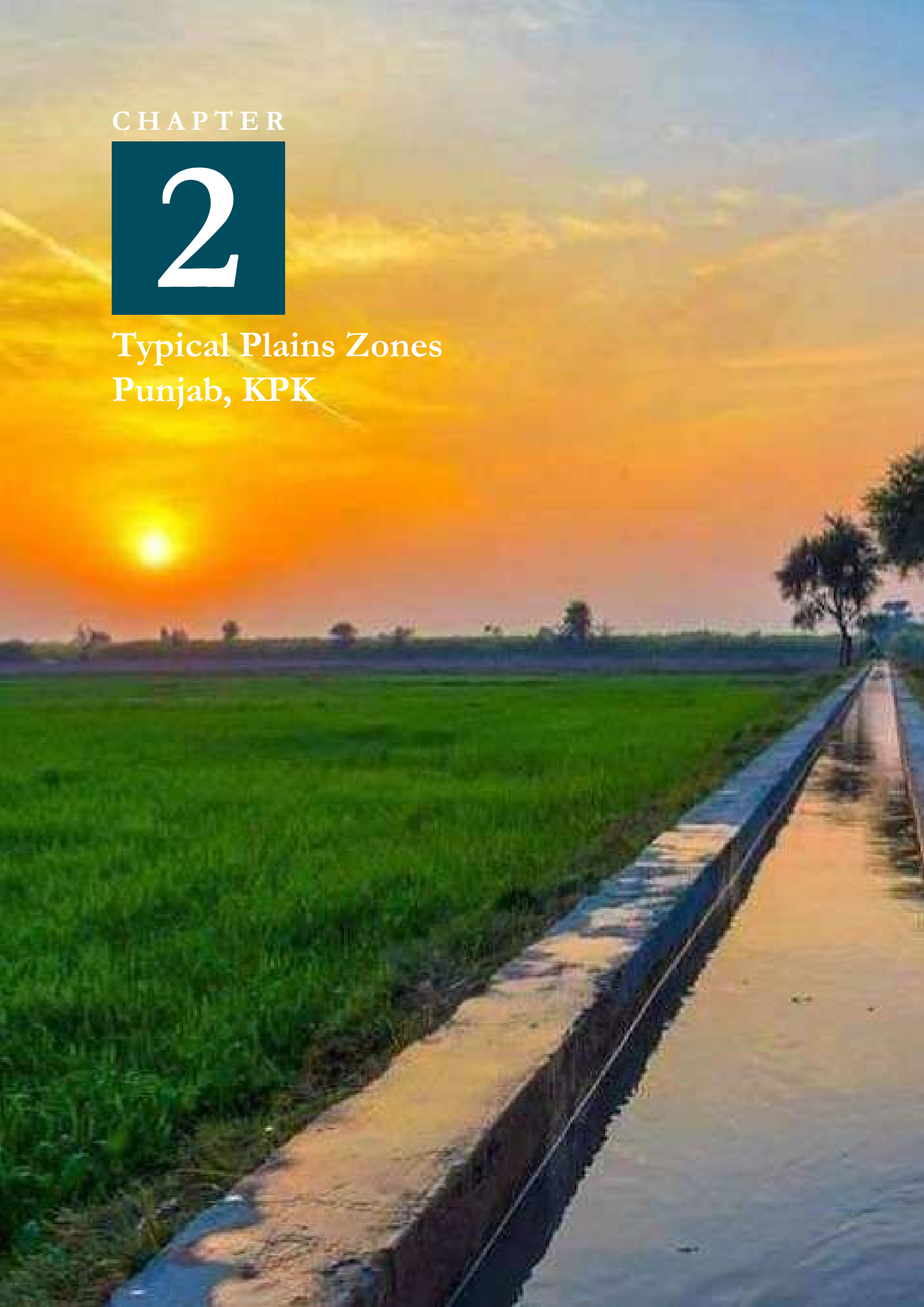
International Academia Input
Search & Rescue, Law Enforcement

- Implement school closures, social distancing measures, patient isolation, and quarantine as precautionary actions.
- Treatment with antiviral and antibiotic medications and implementation of infection control measures.

CHAPTER

2

Typical Plains Zones Punjab, KPK



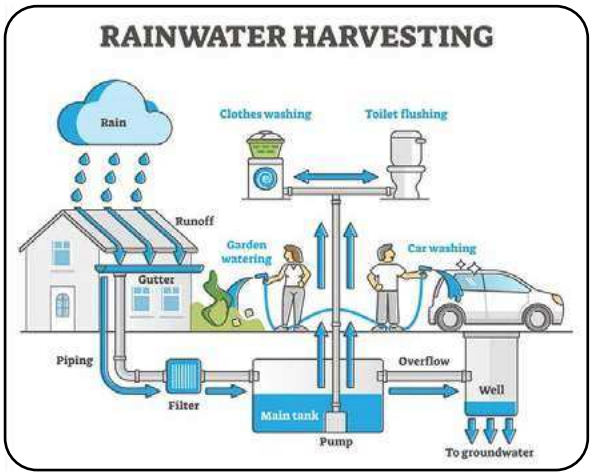
(a) Contingency – Urban Flooding

National Academia Input
Individual & Community Level

- Contribute by responsible disposal of and reducing plastic waste, avoiding the disposal of corrosive substances and oils into drains, installing rainwater harvesting systems, and using permeable surfaces for groundwater replenishment.
- Collaborate efforts to clear drainage systems, implement early warning systems.
- Enhance local greenery in public spaces and parks by planting more trees and grass, promoting natural water absorption and minimizing surface runoff.
- Collaborate with local authorities to address drainage issues, report problems, and participate in urban planning discussions.

International Academia Input
Individual & Community Level

- Establish green infrastructure and permeable surfaces in houses to absorb and filter rainwater.
- Nature-Based Solutions (NBS) play a crucial role in green infrastructure, rainwater harvesting, and sustainable drainage systems.
- Conduct flood preparedness workshops for early evacuation, emergency response, and construction of raised platforms for temporary shelter during floods.

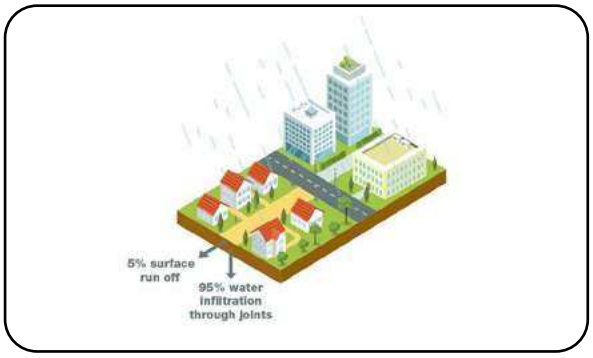


National Academia Input
Area Governance

- Upgrade drainage systems, ensuring regular maintenance, clearing blockages, projects aiming to enhance stormwater underground storage and management.
- Include critical infrastructure, like water treatment plants, groundwater aquifers recharging, flood-resistant bridges and roads in the development plan.
- Establish early warning systems for alert before heavy rainfall.
- Promote reforestation which stabilizes soil and reduces runoff.
- Encourage and invests in climate-adaptive and resilient infrastructure.
- Ensure development funds for the heads of flood resilience initiatives.

International Academia Input
Area Governance

- Integrate green spaces and sustainable drainage systems in urban planning.
- Build elevated buildings and advanced water management infrastructure.
- Adopt comprehensive flood management plan, as underground drainage tunnels, and improved water retention areas.
- Create new green spaces and renovate existing areas to enhance water retention and prevent flooding.
- Promote water-sensitive urban design to integrate stormwater management with urban planning based on local conditions and challenges.

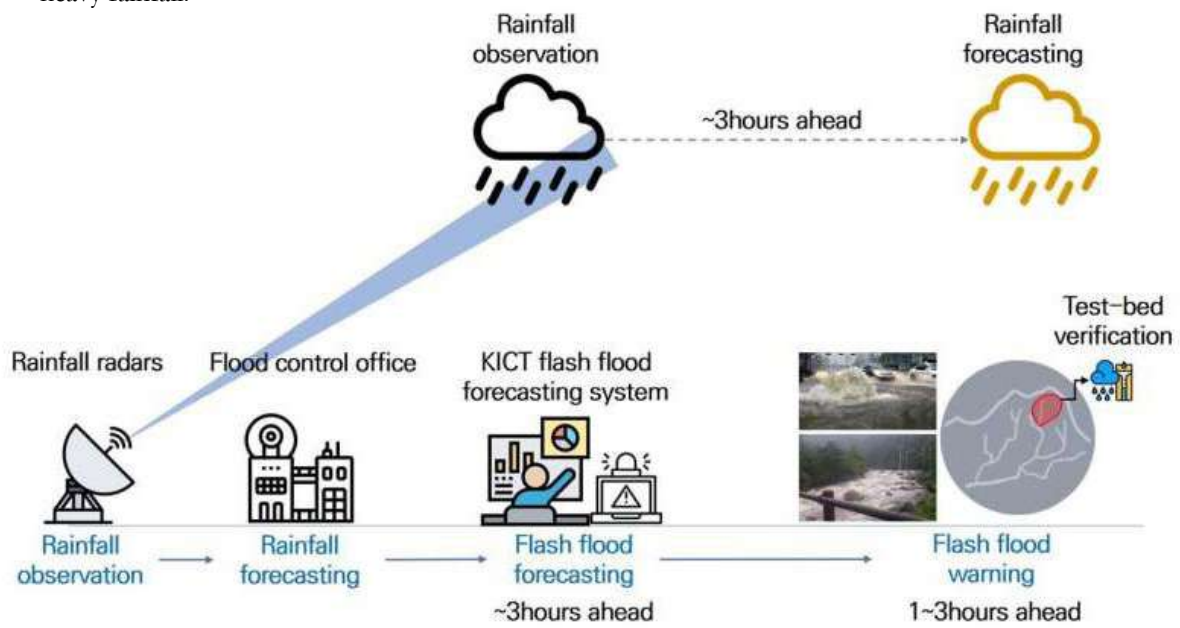


National Academia Input
Role of Federal Organizations

- Collaborate with local authorities to implement flood mitigation strategies and raise awareness on how to mitigate urban flooding.
- Develop flood forecasting models, monitors river flows, and coordinates flood control efforts which requires improved coordination with concerned provincial and local offices.
- Propose, design and implement flood protection infrastructure, like construction of embankments, levees, and stormwater storage and drainage systems in urban areas to prevent flooding during heavy rainfall.

International Academia Input
Role of Federal Organizations

- Provide floodplain management and hazard mitigation programs and guidelines for sustainable development and flood risk reduction.
- Monitor flood control measures, including the construction of reservoirs, river channel improvements, and early warning systems.
- Invest in large-scale water infrastructure projects which aim to transfer water from flood-prone regions to arid areas.

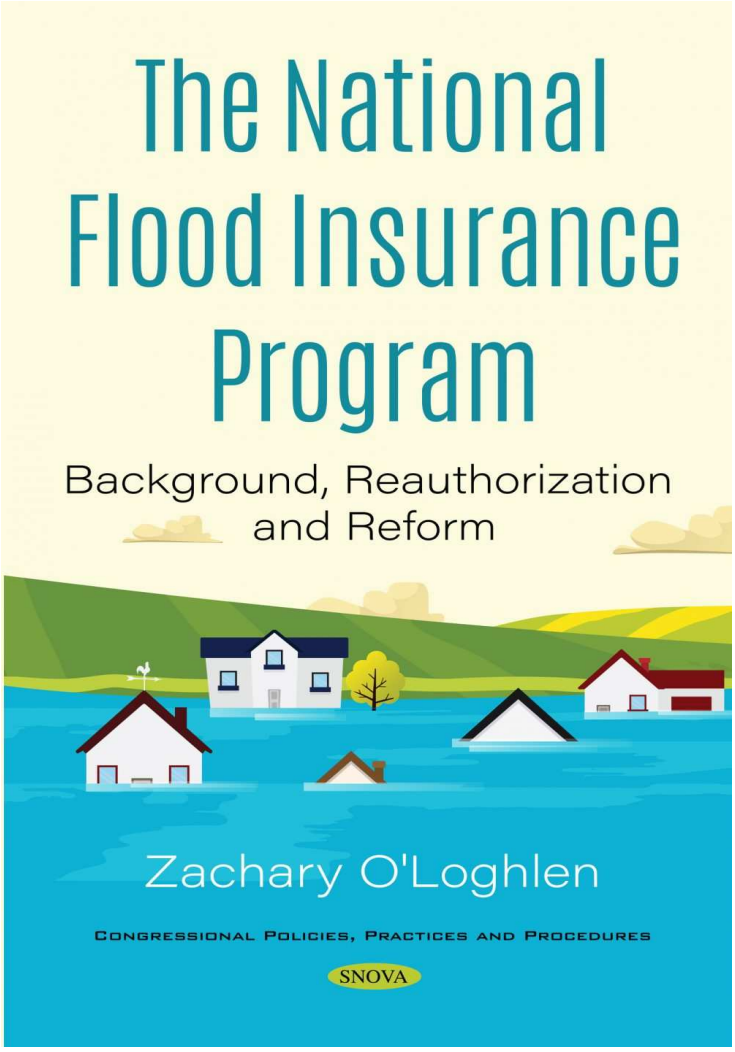


National Academia Input
Private Sector and Local Industry Role

- Develop flood monitoring apps which provide real-time data, allowing them to take timely precautions.
- Support in coordination with state agencies to affected populations during flood emergencies relief.
- Integrate flood resilience into their designs by elevating factory floors, installing flood barriers.
- Design easy-to-build shelters for displaced people.
- Adopt eco-friendly practices, like use permeable pavements, rainwater harvesting systems, and green infrastructure and awareness campaigns.

International Academia Input
Private Sector and Local Industry Role

- Establish flood prediction system that utilizes real-time data, weather forecasts, and historical information to predict flooding events.
- Promote initiatives which involves naturalizing riverbanks, creating floodplains, and removing concrete structures to allow rivers to flow more freely and reduce the risk of flooding.
- Initiate the use of weather radar and sensors to monitor rainfall intensity.
- Assists emergency services to the effected communities in preparing for and responding to flooding events.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Engage in flood relief and prevention by sensitizing communities for the cleaning stormwater drains and improving infrastructure.
- Encourage environment protection and promote afforestation to stabilize soil and prevent flash floods.
- Improve the effectiveness of early warning systems.
- Conduct Disaster risk reduction campaigns and community awareness about flood risks and emergency procedures.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Construct raised plinths for flood-prone homes and focus on community resilience through flood-resistant construction, water harvesting, urban flooding with emergency shelter and resilience programs.
- Promote community engagement and sustainable practices, in addressing urban flooding challenges.
- Implements sustainable water management projects like rain gardens, and develop bioretention systems for stormwater management.
- Emphasize early warning systems and community-based adaptation and flood-resistant infrastructure.

National Academia Input
Area Academia, Think Tanks

- Collaborate and coordinate through a government body, with academia, research institutions, and think tanks to address urban flooding
- Enforce resilient urban planning and ensure provision of meteorological data crucial for academia's research on rainfall patterns and flood prediction models, contributing to evidence-based decision-making in urban flood management.

International Academia Input
Area Academia, Think Tanks

- Introduce flood management innovations and focus on risk assessment including infrastructure solutions.
- Develop targeted policies and support systems by analyzing the social and economic impacts of flooding on communities.
- Advocate for effective flood management policies at the local, regional, and national levels.
- Advocate for nature-based solutions like green infrastructure for flood control.

National Academia Input
Local Media and Early Warning Center

- Address urban flooding by disseminating real-time updates on weather conditions, flood risks, and precautionary measures.
- Advocate local media platforms for better urban planning, infrastructure improvements, and flood risk reduction.
- NDMA and PMD should provide weather forecasts working collectively to disseminate early warnings through various channels.
- Authorities should produce documentaries to raise public awareness.

International Academia Input
Local Media and Early Warning Center

- Collaborate with authorities to promote flood warning system and educates residents on monsoon preparedness.
- Issue an alert for heavy rainfall and monitors various weather events, including floods.
- Media outlets should keep the public informed about weather conditions and flood risks which will enhance community resilience and response to urban flooding.
- Utilizes advanced technologies for flood forecasting, and develop a comprehensive flood warning system.

National Academia Input
Search & Rescue, Law Enforcement

- Contribute to public safety by disseminating flood-related information, participating in relief operations, patrolling vulnerable areas and conducting rescue operations.
- Collaborate with local authorities and organizations, law enforcement ensures a coordinated and prompt response to flood threats.
- Contribute by deploying personnel and assets for flood relief.
- Provincial Disaster Management Authorities, community volunteer groups, and international humanitarian organizations collaborate to conduct search and rescue operations during flood incidents, emphasizing a comprehensive and coordinated response.

International Academia Input
Search & Rescue, Law Enforcement

- Deploys specialized teams for water rescues and local fire departments.
- Utilizes the National Disaster Response Force (NDRF).
- Prioritize finding people trapped in flooded homes, vehicles, or stranded on rooftops.
- Train manpower in water rescue techniques to safely evacuate people from floodwaters. This may involve using life rafts, throw lines, or wading through floodwaters.
- Maintain order and control crowds, especially during evacuations.

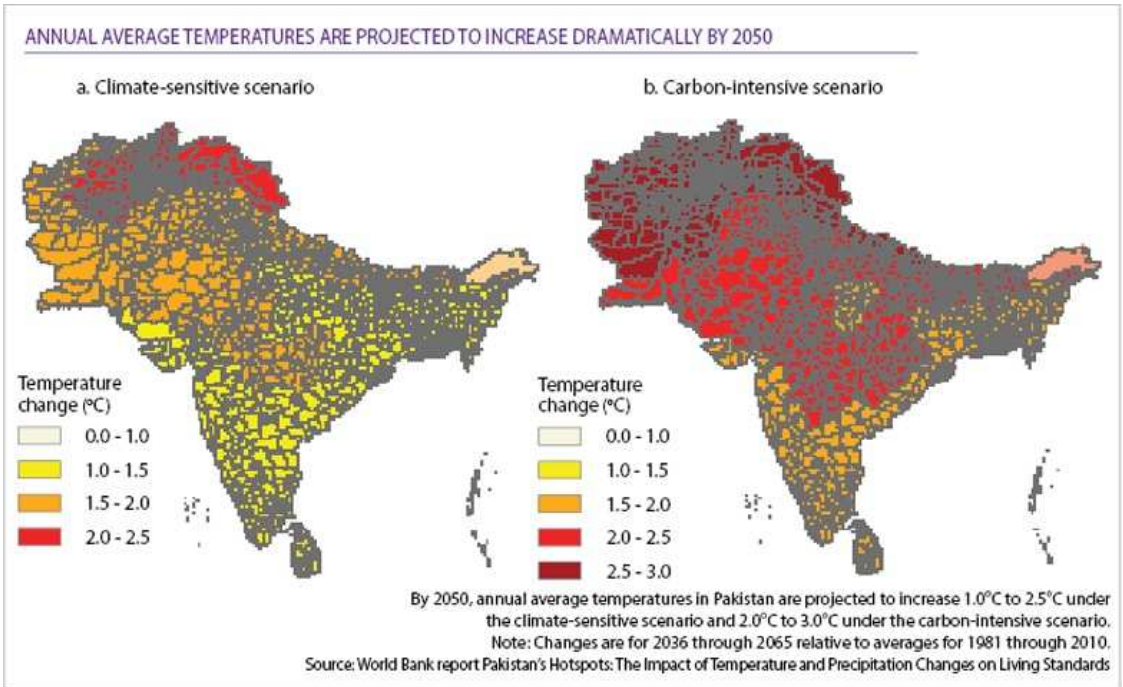
(b) Contingency – Rising Temperature

National Academia Input
Individual & Community Level

- Take initiatives like tree plantation campaigns, advocate for green urban spaces, adopting cool roof technologies and promoting awareness on heat-related health practice.
- Establish community cooling centers and encourage energy-efficient practices.
- Encourage water conservation efforts and collaboration with local authorities for sustainable urban planning and climate-resilient infrastructure.

International Academia Input
Individual & Community Level

- Take initiative like urban greening projects, cool roof programs, heat-resilient infrastructure, and community-led climate action.
- Promote cool roof installations, while others, including Singapore and the UAE, invest in heat-resilient infrastructure.
- Promote community-driven efforts like the establishment of cooling centers during heatwaves, water conservation projects, and education programs on climate resilience.



National Academia Input
Area Governance

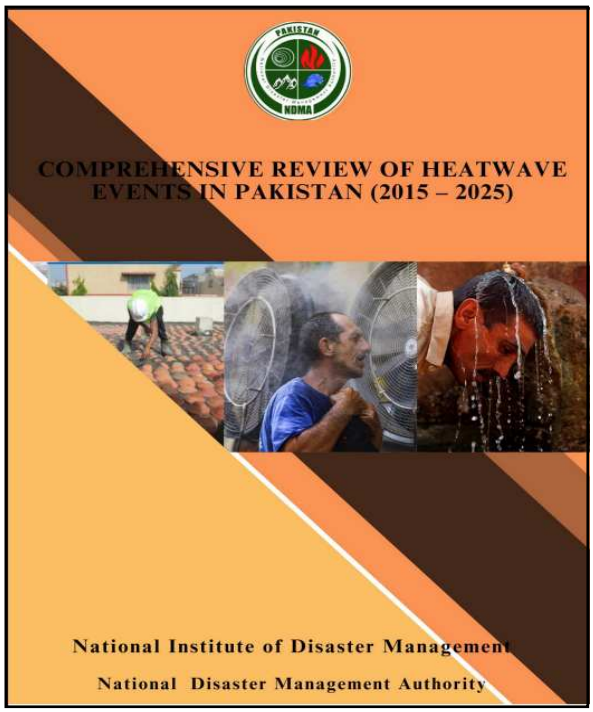
- Adopt measures and sustainable development practices, including afforestation through the Green Pakistan Program.
- Follow the Urban planning guidelines which prioritize green spaces and sustainable building practices to counteract the urban heat island effect.
- Promote clean and renewable energy, commitment to Sustainable Development Goals.
- Emphasize climate-resilient agriculture policies like heat-tolerant crops and sustainable farming. These initiatives collectively demonstrate Pakistan's commitment to addressing climate challenges at the governance level.

International Academia Input
Area Governance

- Promote commitments under the Paris Agreement set emission reduction targets and promote renewable energy adoption like green building standards in countries like Singapore and the UAE focus on energy-efficient construction.
- Implement climate adaptation plans like in the Netherlands and Bangladesh include infrastructure improvements and measures to combat heatwaves.
- Initiate Sustainable transportation like in the Netherlands and Denmark prioritize cycling and public transit.
- Follow International climate finance mechanisms, such as the Green Climate Fund which support developing nations in enhancing climate adaptation and mitigating temperature-related impacts.

National Academia Input
Role of Federal Organizations

- Play pivotal roles in overcoming rising temperatures by coordinating disaster response among various federal department like Pakistan Meteorological Department (PMD) and National Disaster Management Authority.
- Regulate emissions and implement policies to combat rising temperatures, showcasing the diverse global efforts of federal organizations in climate resilience.
- Focus on afforestation, heat-tolerant crops, and water management to address heat-related challenges.



International Academia Input
Role of Federal Organizations

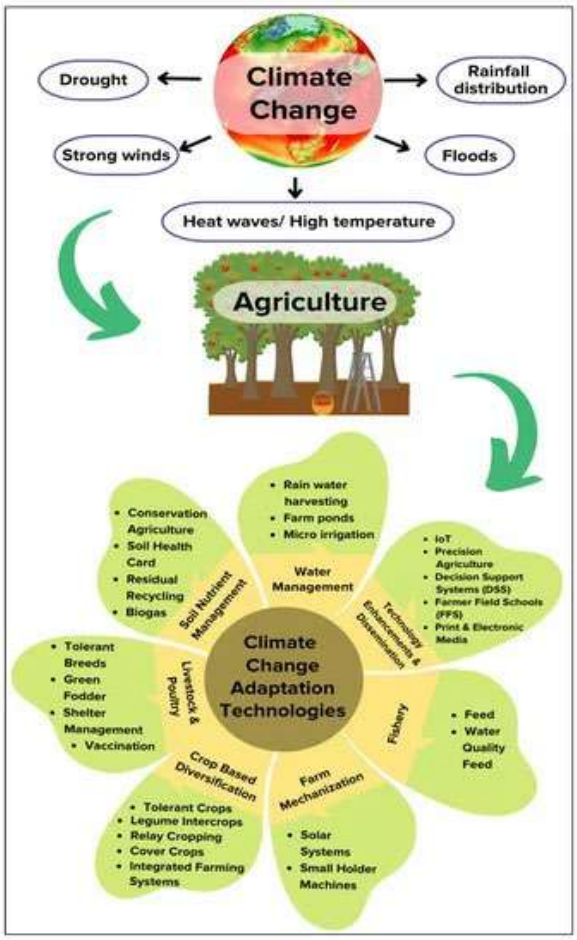
- Adopt initiatives like Federal organizations play a crucial role in mitigating rising temperatures by implementing climate change adaptation initiatives and policies.
- Involve in addressing the impacts of climate change to limit future damages and associated costs. Moreover, mainstreaming climate considerations into programs and policies, identifying vulnerabilities, and developing adaptation plans.
- Strengthen the institutional mechanisms, providing training programs, and incorporating environmental justice and equity principles into their policies.

National Academia Input
Private Sector and Local Industry Role

- Contribute to climate change mitigation by adopting sound business models for environmental protection, reducing costs, and increasing efficiency through improved environmental performance.
- Involve in financing low-carbon and climate-resilient development, as well as investing in renewable energy and sustainable practices, for vital for achieving climate goals

International Academia Input
Private Sector and Local Industry Role

- Promote access to green technologies for climate resilience.
- Adopt sustainable practices, reduce emissions, and invest in clean technologies where local industries can significantly contribute to reducing greenhouse gas emissions and promoting climate resilience.
- Play role in adapting operations and business models to climate change which not only ensures survival but also presents opportunities for companies to become more resilient.
- Tap into new markets, and offer adaptation products and services.

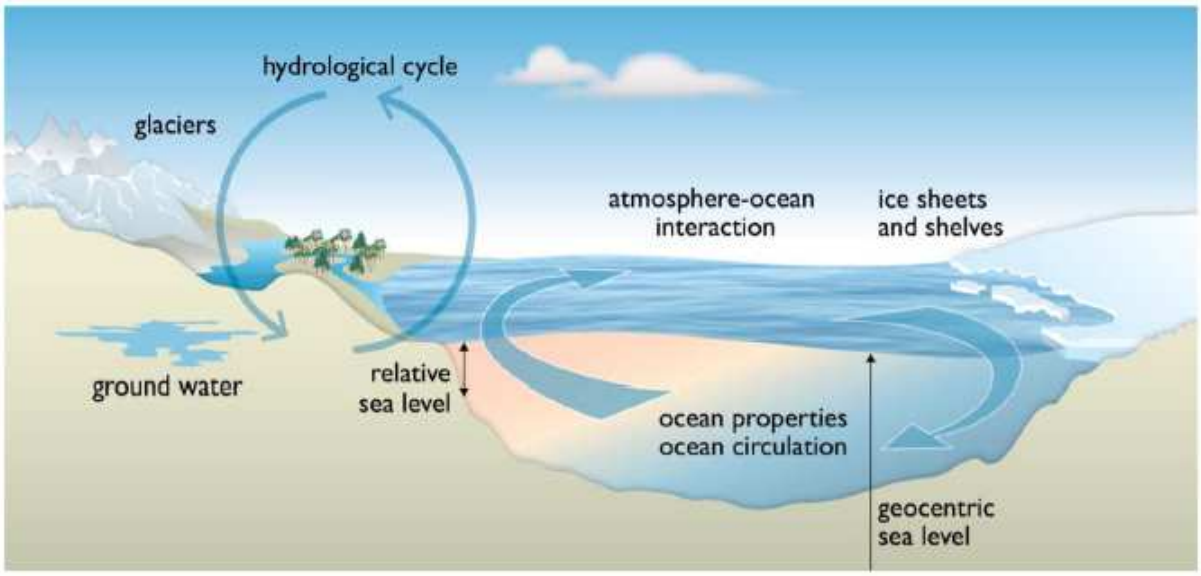


National Academia Input
NGOs, Humanitarian Resource Enablers

- Play a significant role in rising temperature mitigation by supporting climate resilience initiatives, providing resources, and facilitating adaptation actions.
- Contribute to strengthening climate resilience through various enablers such as nature-based solutions (NBS) and forecast-based financing.
- Protect, manage and restore natural capital to enhance ecosystem services, addressing social, environmental, and economic challenges.
- Anticipate disasters being pioneering forecast-based financing, limit their impact, and reduce human suffering and losses.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Collaborate with development support providers to harmonize approaches, facilitate information exchange, and avoid duplicated efforts in climate resilience initiatives
- Work on enhancing local capacities, supporting investment in climate-smart urban development planning, and incorporating environmental justice and equity principles into their policies to address climate-related challenges effectively.

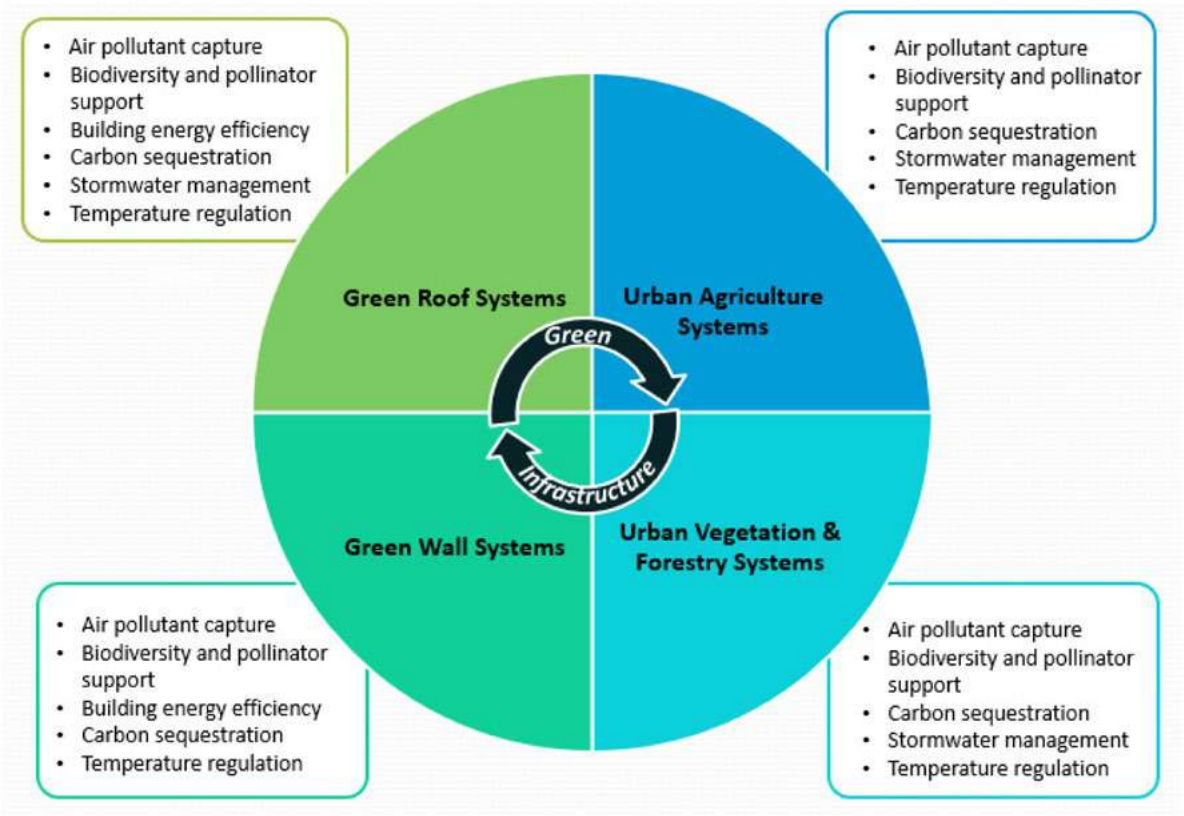


National Academia Input
Area Academia, Think Tanks

- Play a crucial role in rising temperature mitigation by generating knowledge, conducting research, and providing policy recommendations to address climate change challenges effectively. Academia, particularly universities, serves as key players in climate change research, knowledge dissemination, and innovation in sustainable practices.
- Contribute to climate change mitigation through initiatives like reducing greenhouse gas emissions, investing in renewable energy, and promoting climate-friendly actions among students and communities.

International Academia Input
Area Academia, Think Tanks

- Provide valuable insights, analysis, and policy recommendations to policymakers and the public on climate change mitigation strategies. They offer a platform for experts to engage in research, analysis, and advocacy related to climate change adaptation and resilience building.
- Contribute to shaping public discourse, influencing policy decisions, and promoting innovative solutions to address the impacts of rising temperatures. By bridging the gap between academia and policymakers, think tanks play a critical role in translating scientific research into actionable policies and strategies.

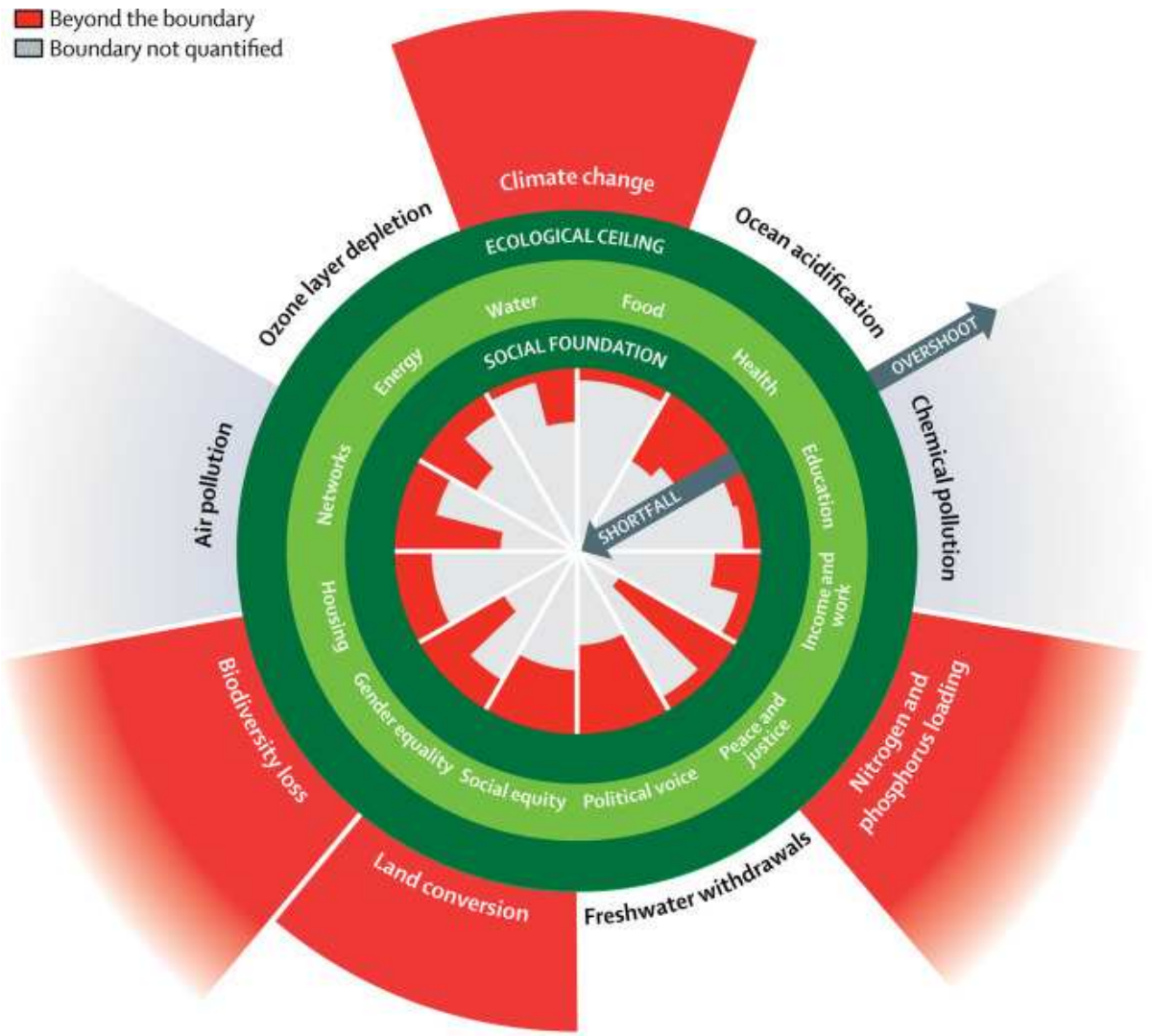


National Academia Input
Local Media and Early Warning Center

- Play a vital role in communicating heat warnings, risk factors, and recommended responses to the public, especially vulnerable groups like older adults, children, and outdoor workers.
- Provide educational content, heat wave alerts, and health information, local media help ensure that individuals are informed and prepared to cope with extreme heat conditions effectively.

International Academia Input
Local Media and Early Warning Center

- Issue heat alerts and coordinate response efforts during heat waves.
- Play a critical role in forecasting and monitoring extreme heat events, providing timely warnings to the public, and collaborating with local authorities to implement heat response plans.
- Work closely with meteorological services, emergency management agencies, and public health officials, early warning centers contribute to reducing the impacts of extreme heat on communities and infrastructure.



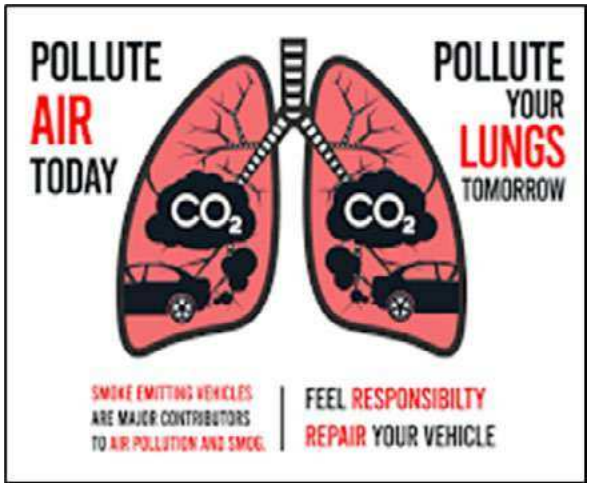
(c) Contingency – Smog, Fog, Air Pollution

National Academia Input
Individual & Community Level

- Contribute by adopting eco-friendly transport, practicing responsible waste management, and using clean energy sources.
- Promote in organizing tree plantation drives, advocating for green building practices, and monitoring local air quality.
- Organize public awareness campaigns, community-led initiatives for emission reduction.
- Actively participate in environmental advocacy contributes to a collective effort in overcoming air pollution challenges.

International Academia Input
Individual & Community Level

- Promotes sustainable transportation by adopting renewable energy.
- Showcase sustainable practices, relying heavily on renewable energy.
- Utilize advanced air quality monitoring, and supports stringent environmental policies.
- Focuses on waste reduction and recycling.

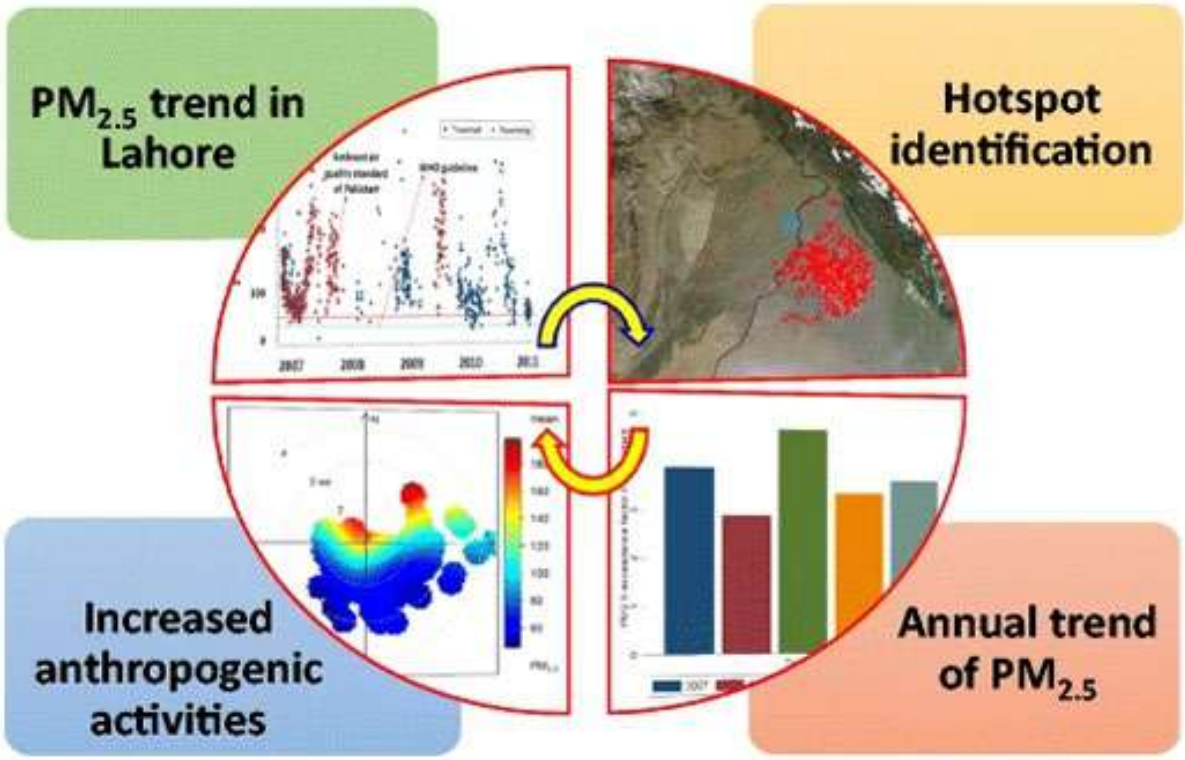


National Academia Input
Area Governance

- Enforce stringent emission standards, promote urban forestry, improve public transport like Peshawar's BRT system, implement waste management policies, raise awareness, manage traffic and collaborate with industries for cleaner practices.
- Improve air quality through technological advancement to address harmful air pollutants originating from industrial waste.
- Introduce 'Smog Alerts' in certain regions and demonstrates an emergency response to high pollution levels.

International Academia Input
Area Governance

- Shift from coal to nuclear energy and the transition to electric transportation are aimed at reducing air pollution.
- Generate cleaner electricity and promoting electric vehicles.
- Implement an odd-even traffic scheme like Oslo promotes electric vehicles.
- Emphasizes green building standards like Tokyo, invests in a Bus Rapid Transit system (Mexico City), and concentrates on urban greening initiatives (Sydney).

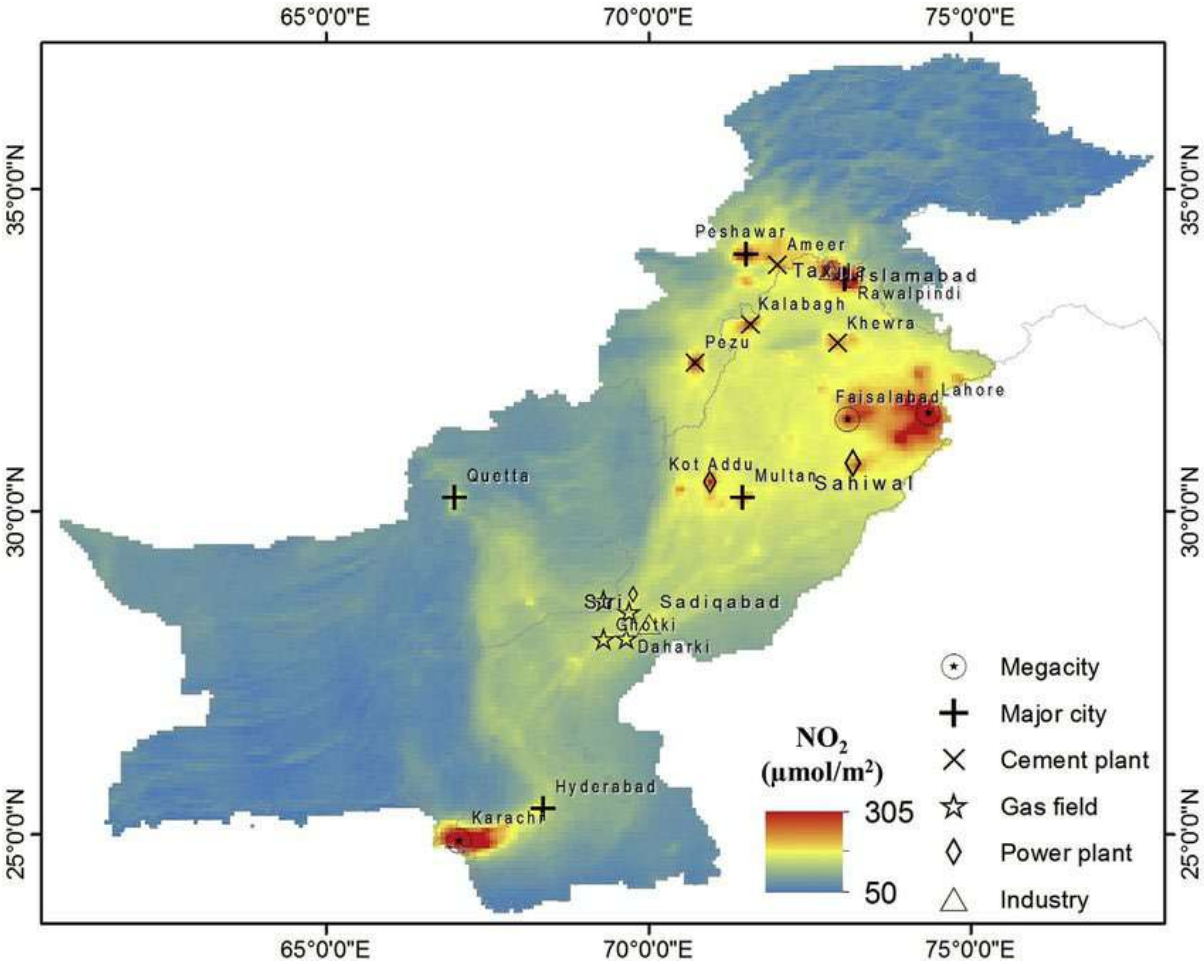


National Academia Input
Role of Federal Organizations

- Set and enforce stricter regulations to limit air pollution and greenhouse gas emissions from industries, power plants, and vehicles.
- Offer incentives and funding for research and development of renewable energy sources like solar and wind power.
- Track and report on greenhouse gas concentrations to assess the effectiveness of mitigation strategies.
- Take Initiatives like the Green Pakistan Program and efforts by institutions like the National Agricultural Research Center (NARC) and Pakistan Council of Research in Water Resources (PCRWR) focus on afforestation, heat-tolerant crops, and water management to address heat-related challenges.

International Academia Input
Role of Federal Organizations

- Enforce standards and promote alternative fuels options e.g. U.S. EPA (Environmental Protection Agency)
- Address air pollution through emission standards, cleaner technologies like China's Ministry of Environmental Protection.

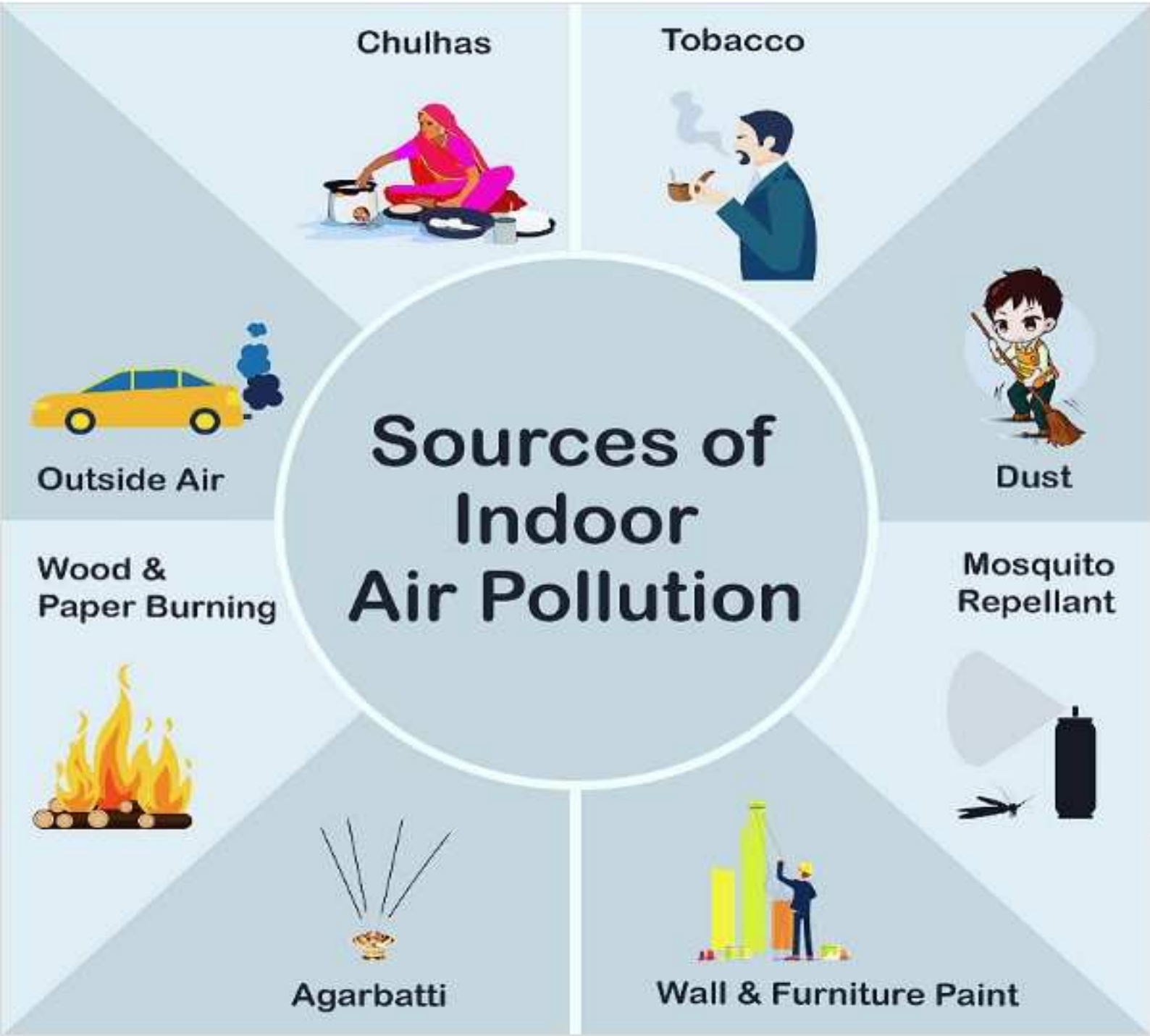


National Academia Input
Private Sector and Local Industry Role

- Combat air pollution by adopting cleaner technologies, such as advanced dyeing methods in textiles and optimizing processes in steel production. Renewables, like solar panels in cement manufacturing, contribute to cleaner energy.
- Focus on reducing emissions from transportation, and innovations in fuel-efficient cars and catalytic converters demonstrate the industry's commitment to air pollution mitigation like the SmartWay Program.

International Academia Input
Private Sector and Local Industry Role

- Combat air pollution through initiatives such as Google's investment in renewable energy, Unilever's emission reduction targets, Tesla's production of electric vehicles, Nestlé commitment to sustainable packaging etc.
- Adopt advancements like in sensor technologies and analytics enable businesses to measure and manage their air pollution footprint effectively, giving them a competitive edge in accelerating solutions and reducing pollution levels.

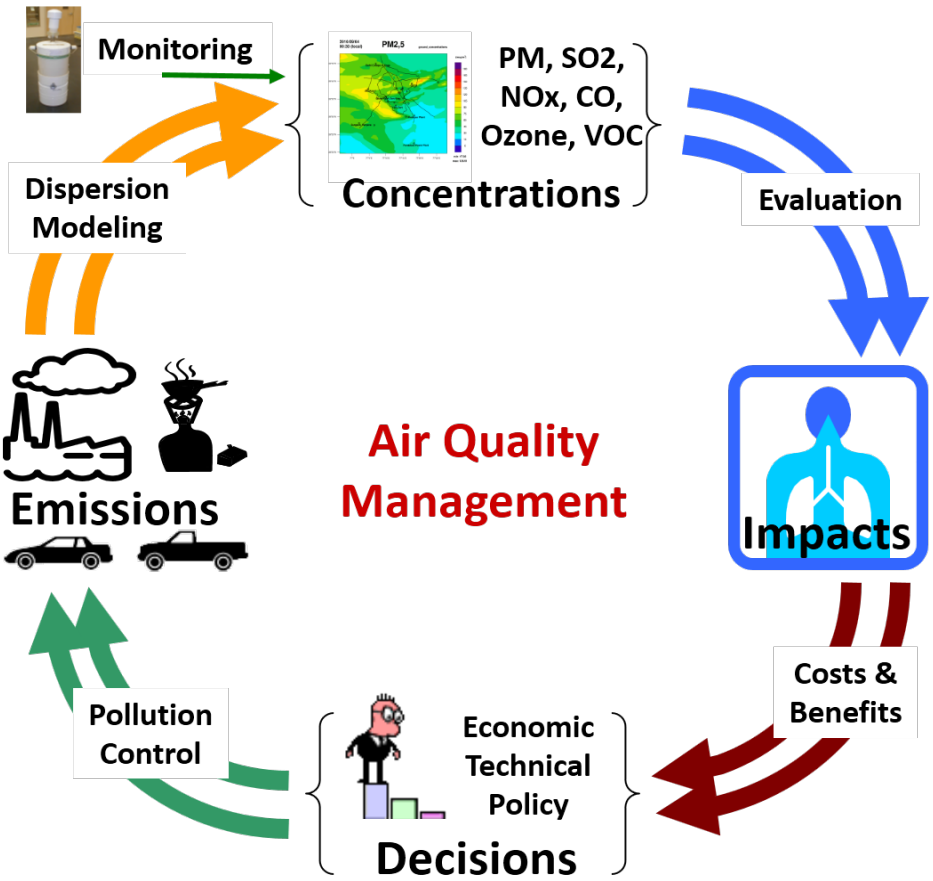


National Academia Input
NGOs, Humanitarian Resource Enablers

- Take initiatives like the Clean Green Pakistan campaign, led by the Ministry of Climate Change and supported by various NGOs, focus on tree plantation and community engagement. WWF Pakistan's.
- Support initiatives that focus on reducing emissions, improving environmental performance, and fostering green growth to combat air pollution and its adverse effects on public health and the environment

International Academia Input
NGOs, Humanitarian Resource Enablers

- Collaborate with NGOs and research institutions to improve air quality. Friends of the Earth operates globally through regional chapters, influencing policies and mobilizing communities for environmental protection.
- Improve environmental quality and reduce air pollution levels.
- Engage communities in various activities such as environmental campaigns, cooperation with international NGOs, establishing relations with enterprises and governments.
- Collaborate with media organizations and engage in transnational cooperation to address cross-border pollution issues.

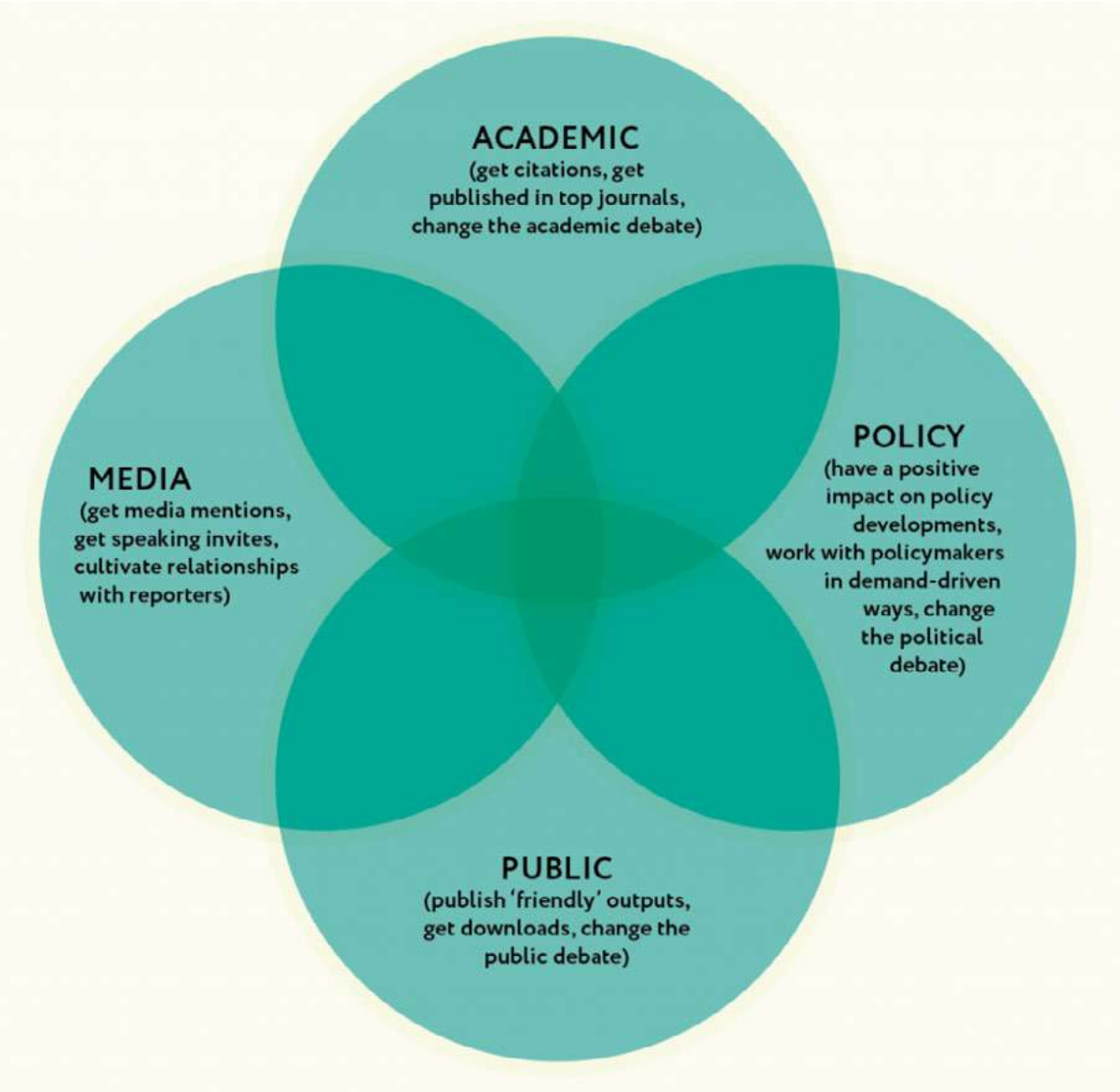


National Academia Input
Area Academia, Think Tanks

- Engages with academia, conducting policy research and advocating for sustainable urban development.
- Collaborate with research institutions, providing crucial meteorological data for informed decision-making on air quality and pollution mitigation strategies.

International Academia Input
Area Academia, Think Tanks

- Engage in interdisciplinary research to inform sustainable development policies.
- Focus on analyzing environmental policies, evaluating the effectiveness of mitigation measures, and proposing innovative solutions to address air pollution issues



National Academia Input

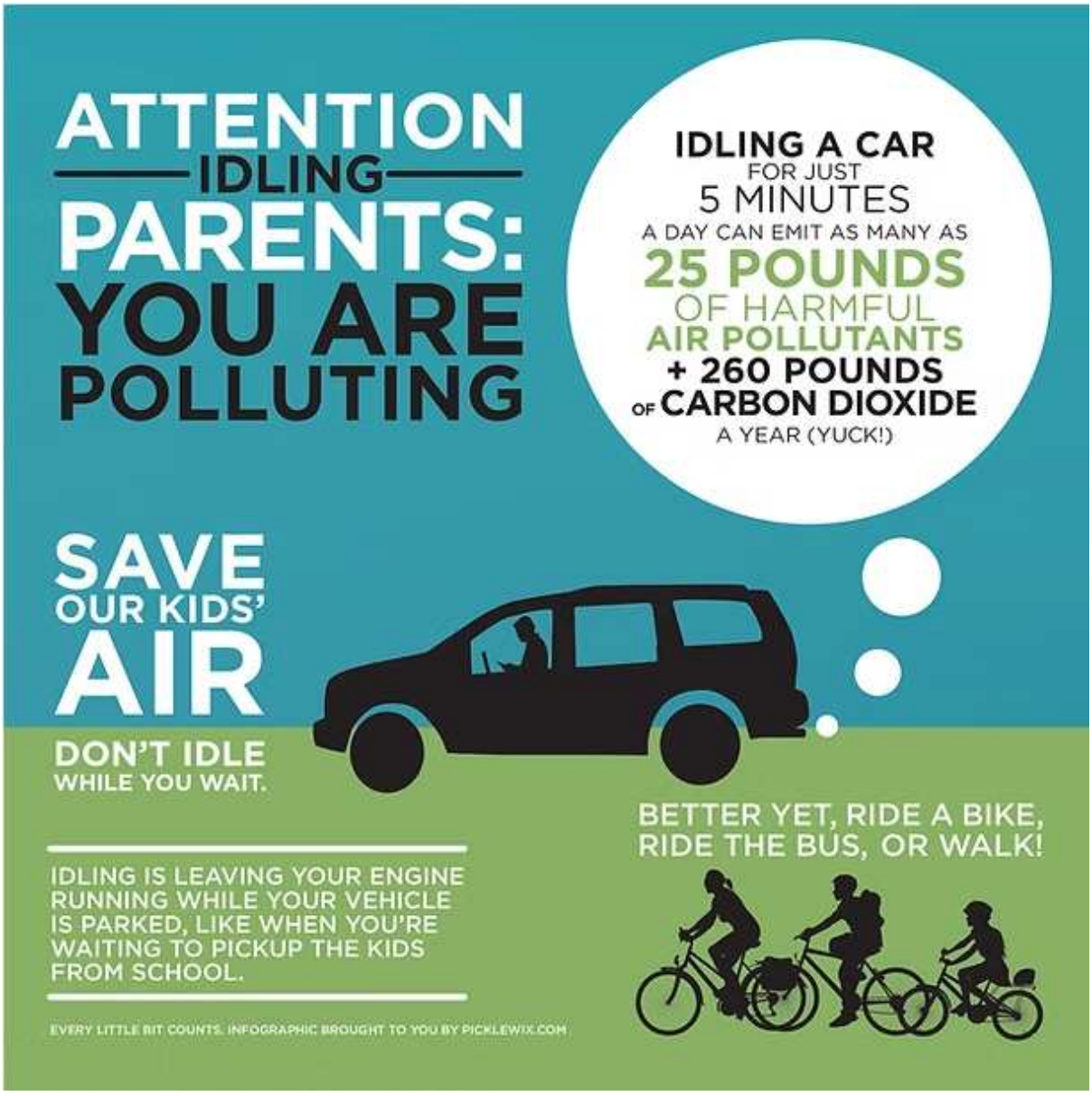
Local Media and Early Warning Center

- Conduct awareness campaigns through television, radio, and online platforms, disseminating information on the causes and consequences of air pollution.
- Provide real-time air quality updates, share forecasts, and broadcast public service announcements.

International Academia Input

Local Media and Early Warning Center

- Deliver air quality alerts through local media to keep residents informed.
- Communicate to the public through local media based on forecasts from Early Warning Centers like Delhi's Graded Response Action Plan.
- Raise public awareness about the causes and consequences of rising temperatures through informative reporting, interviews with experts, and public service announcements.
- Showcase local initiatives and success stories related to climate change mitigation and adaptation. This can inspire others and encourage community action.
- Conduct risk assessments to identify areas vulnerable to the impacts of rising temperatures, such as heat stress or flooding.



National Academia Input
Search & Rescue, Law Enforcement

- Manage traffic, enforce emission control measures, and regulate industrial activities to curb pollution.
- Monitor cases of illegal waste burning and construction activities which can help in prevention of harmful emissions.
- Contribute by responding swiftly to industrial incidents and natural disasters, minimizing their environmental impact.

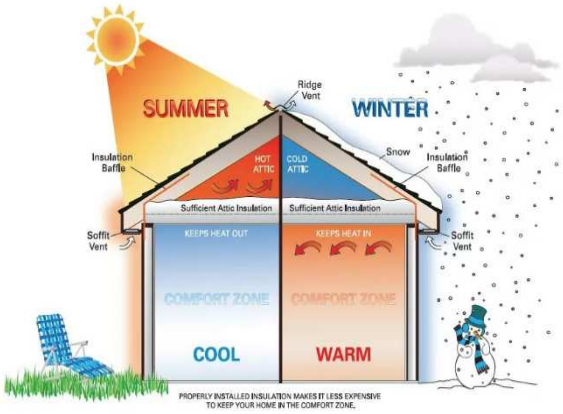
International Academia Input
Search & Rescue, Law Enforcement

- Enforce strict traffic management measures by law enforcement reduce vehicle emissions e.g.; in Mexico City.
- Respond to wildfires, coordinating with law enforcement to minimize their impact on air quality like California's Search & Rescue teams.
- Respond to industrial accidents to contain pollutants.
- Highlight the vital role of Search & Rescue and Law Enforcement in mitigating air pollution globally.

(d) Contingency – Cold Wave Punjab, KPK & Upper Sindh

National Academia Input
Individual & Community Level

- Use of mittens instead of gloves.
- Insulate your home to reduce heat loss and keep the interior temperature reasonable and properly insulate your doors, windows, and walls.
- Exposed pipes should be insulated to avoid freezing and dangerous explosions. Heat tape or pipe insulation wraps are excellent protective measures in low-temperature regions such as crawl spaces, attics, and basements.
- Prepare emergency supplies for a power outage or other disruption in services during extremely cold weather, stock up on necessities including food, water, medicines, flashlights, batteries, and blankets.



International Academia Input
Individual & Community Level

- Prioritize cold-prone regions expanding air conditioning penetration and healthcare spending.
- Dress warmly to efficiently preserve body heat, wear layered clothing.
- It is recommended to prioritize safety to avoid carbon monoxide poisoning and fire threats.
- Check on vulnerable people and make sure that elderly neighbors, family members, and people with disabilities or medical conditions are safe and well during cold waves by conducting routine checks on them.

National Academia Input
Area Governance

- Emphasize the needs of those who are homeless or have limited income. In order to properly address the various needs of all residents, shelter services must be inclusive and equitable.
- Monitor, review, and adaptation of the plan are required to handle developing difficulties while also improving preparedness and reaction processes.
- Raise awareness about available resources and fostering community engagement are important components of protecting vulnerable groups during cold waves.

International Academia Input
Area Governance

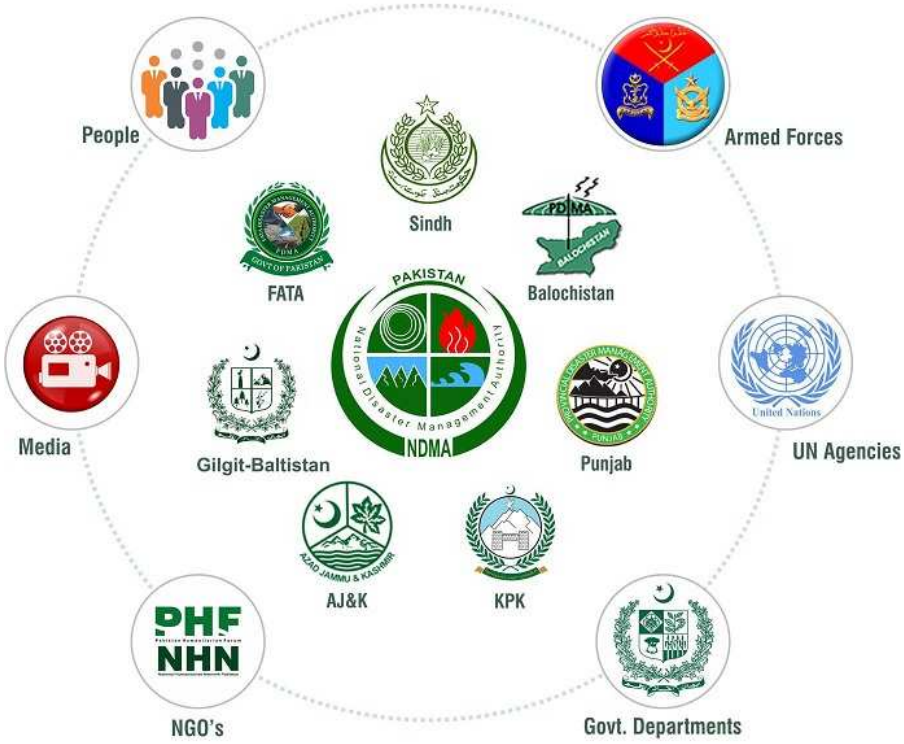
- Prioritize implementing utility assistance programs to help low-income households meet heating costs.
- Policymakers, health officials, and communities should consider investing in infrastructure and healthcare resources to help them withstand extreme cold weather events.
- Replace incandescent light bulbs with energy-efficient compact lights to save energy to avoid power outage.

National Academia Input
Role of Federal Organizations

- Track weather patterns and send out timely alerts about approaching cold waves, governments should invest in meteorological services and early warning systems.
- Inform the public about the dangers of cold waves and to encourage preventative actions like clothing warmly, keeping inside during extremely cold temperatures.

International Academia Input
Role of Federal Organizations

- Recommend those locations prone to cold waves to use strategy in their winter readiness and resilience measures.
- Improve cold wave prediction models, strengthen infrastructure resilience, and create novel solutions to lessen the effects of extreme cold weather occurrences, governments fund research and development projects.

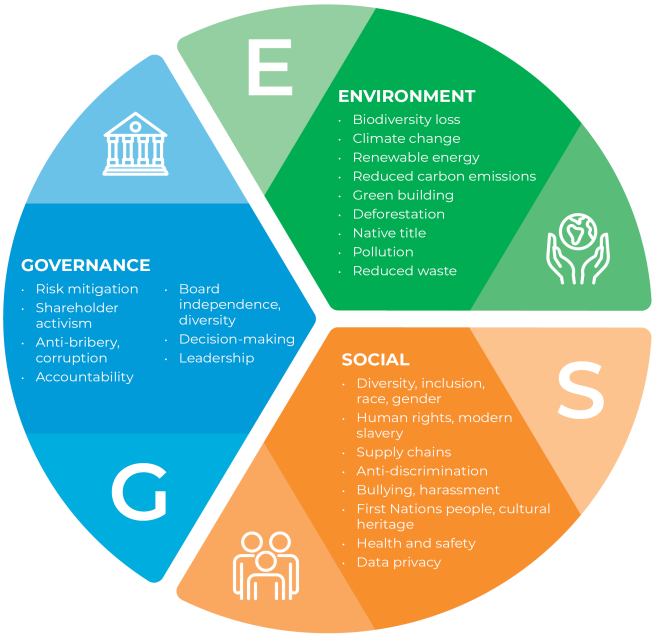


National Academia Input
Private Sector and Local Industry Role

- Collaborate with social service organizations to ensure vulnerable individuals receive necessary care and support during cold waves.
- Invest in infrastructure projects that improve heating systems, insulation, and energy efficiency in buildings to help communities withstand cold waves more effectively.

International Academia Input
Private Sector and Local Industry Role

- Modernize shelters with insulation materials and incorporating features like solar heating panels can significantly improve thermal comfort during cold snaps.
- Develop innovative technological solutions for cold wave mitigation, such as energy-efficient heating systems, weather monitoring tools, and early warning systems to alert communities about impending cold waves.

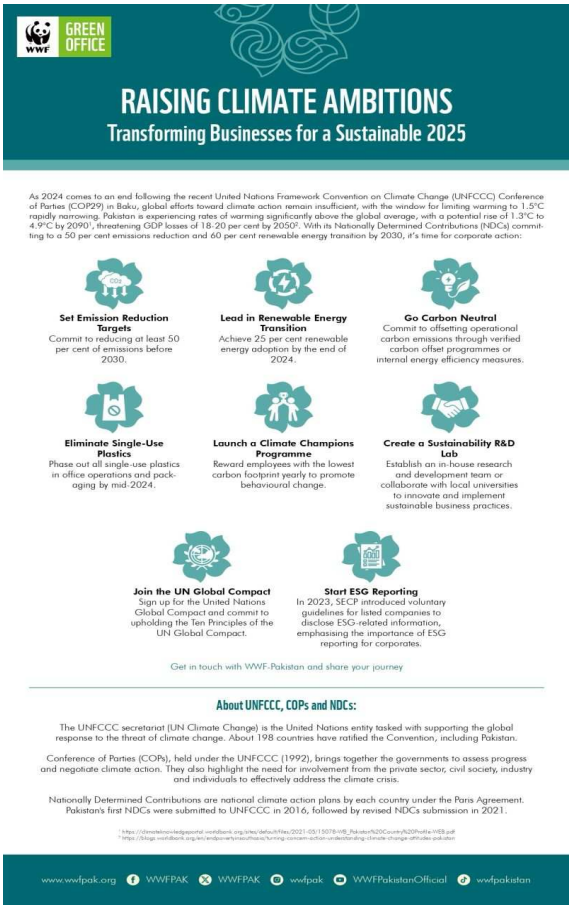


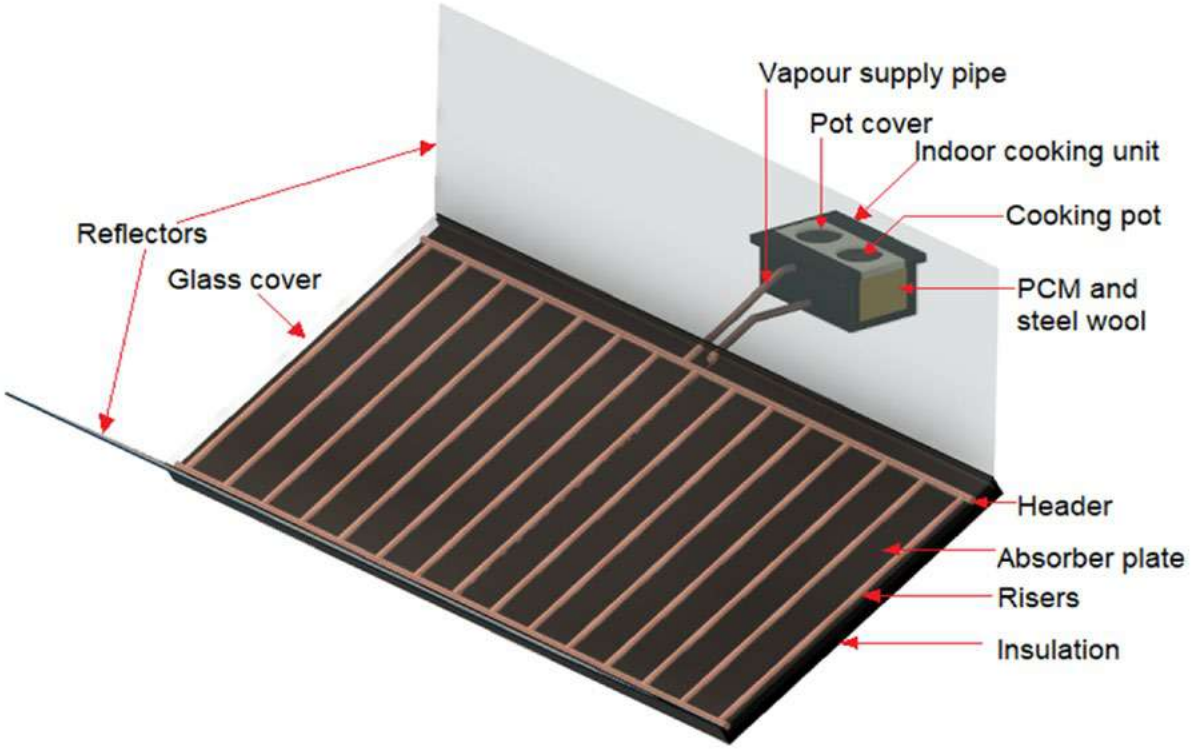
National Academia Input
NGOs, Humanitarian Resource Enablers

- Introduce efficient heating options like LPG stoves or solar-powered heaters which can provide warmth while minimizing fuel consumption
- Facilitate the integration of sustainable energy solutions into humanitarian coordination mechanisms,
- Enabling cross-sectoral collaboration and advocate for improved action on energy in displacement settings.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Implement stricter building codes and standards that promote energy efficiency and thermal insulation in new constructions.
- Lead responses to cold waves by providing shelter, food, water, and safety to displaced populations improving resilience to cold spells.





National Academia Input
Area Academia, Think Tanks

- Try to avoid being outside as much as possible, especially when it's extremely cold outside, to reduce your exposure to wind chill and low temperatures.
- Proceed with caution when traveling during cold waves.
- Play a crucial role in building the capacity of stakeholders, including government agencies, NGOs, and communities, to effectively respond to cold waves.
- Offer training programs, workshops, and knowledge-sharing platforms to enhance awareness and preparedness at various levels.

International Academia Input
Area Academia, Think Tanks

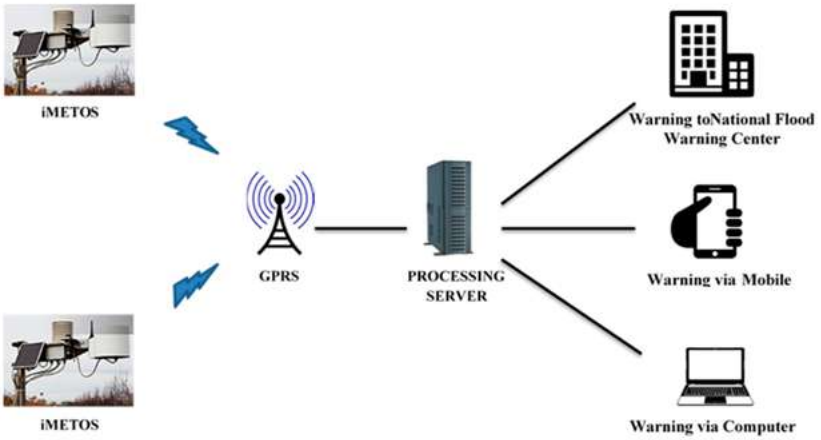
- Keep livestock and pets safe from the cold, bring them inside or make sure they have enough food, drink, and shelter.
- Maintain Indoor temperature during cold waves, make sure your home is warm enough to provide comfort and safety.

National Academia Input
Local Media and Early Warning Center

- Provide real-time updates, weather forecasts, and alerts to the community, enabling individuals to stay informed about cold wave conditions, potential risks, and necessary precautions.
- Collaborate with local authorities, disaster management agencies, and other stakeholders to ensure coordinated responses, effective communication strategies, and the swift dissemination of critical information to mitigate the impacts of cold waves on vulnerable populations.

International Academia Input
Local Media and Early Warning Center

- It is strongly advised to keep up with local authorities' weather forecasts and warnings.
- Engage with the community to encourage proactive measures such as winterization of homes, stockpiling of essential supplies, and seeking shelter during cold wave alerts to minimize risks and enhance resilience.



National Academia Input
Search & Rescue, Law Enforcement

- Responsible for locating and rescuing individuals who may be stranded or in distress due to cold waves, while Law Enforcement agencies help in maintaining order, managing traffic, and coordinating emergency responses. Together, they work to safeguard lives, prevent accidents, and support communities in coping with the challenges posed by cold waves.
- Develop a team in responding to emergencies, providing assistance to stranded individuals, and facilitating evacuations when necessary.

International Academia Input
Search & Rescue, Law Enforcement

- Make investments in infrastructure upkeep and upgrades to strengthen the resiliency of vital services in the event of cold waves.
- Promote Law enforcement officers (LEOs) and tactical medical providers (TMPs) involved in high-threat operations who face challenges related to cold weather that can lead to injuries and impact mission success.

(e) Contingency – Ecosystem Imbalance and Degradation of Forests

National Academia Input
Individual & Community Level

- Use of solar stoves instead of green wood cutting.
- Improve community resilience and sustainable development, offer technical help, chances for alternative livelihoods, and capacity-building assistance.
- Promote ecosystem integrity, such as sustainable forest management practices, biodiversity conservation, and climate mitigation efforts.

International Academia Input
Individual & Community Level

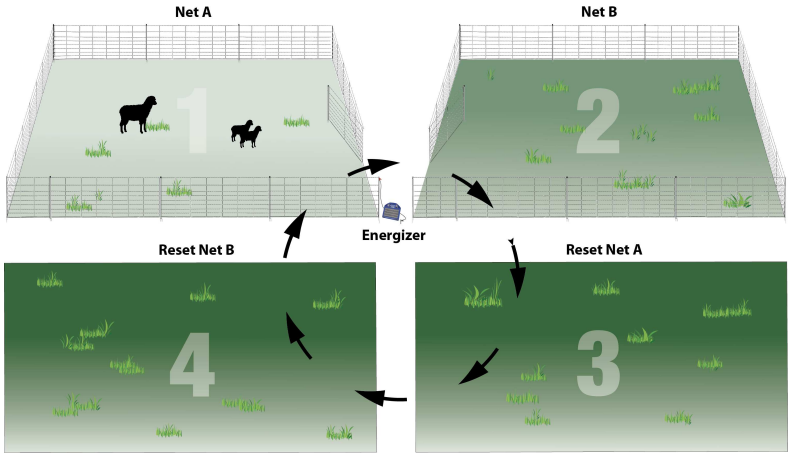
- Use of synthetic wood polymers as construction material and furniture.
- Use Community-Based conservation strategies, local communities and indigenous peoples are empowered to take care of the forest resources.

National Academia Input
Area Governance

- Improve the precision and reliability of deforestation monitoring systems, a wide range of data sources must be integrated, including satellite imaging, ground-based observations, remote sensing data, and geographic information.
- Encourage the use of collaborative initiatives that involve local communities, indigenous groups, and citizen scientists in monitoring efforts.

International Academia Input
Area Governance

- Stop degradation and promote long-term restoration activities toward international and national goals, practices of conservation, sustainable management, and ecosystem and landscape restoration must be successfully coordinated.
- Improve monitoring efficacy while also encouraging transparency, responsibility, and community ownership of forest resources.

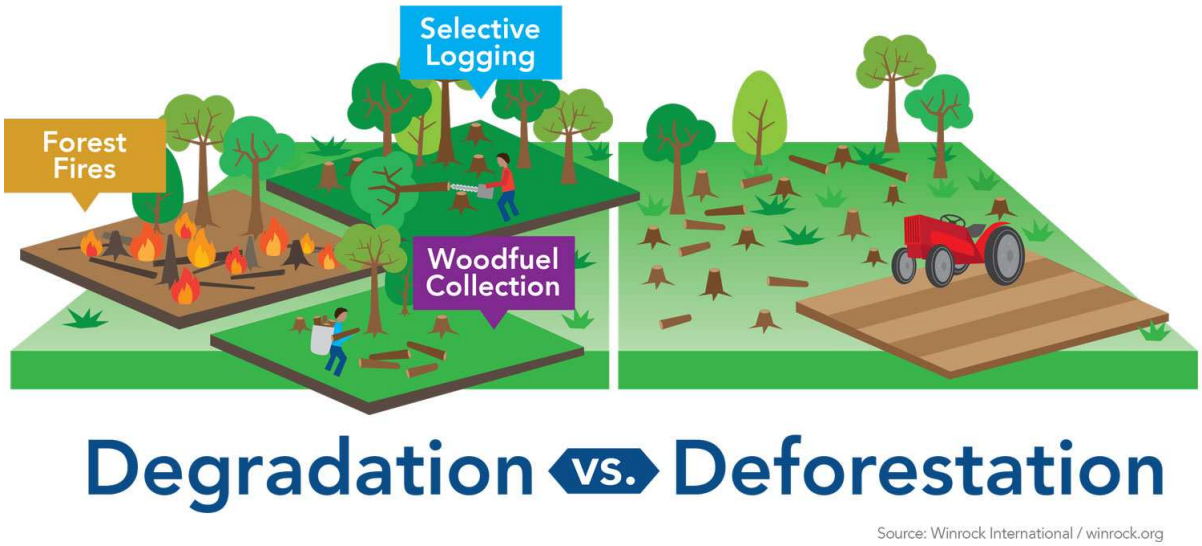


National Academia Input
Role of Federal Organizations

- Recommend that stakeholders organize resources, skills, and community support to combat deterioration and assist ecological restoration.
- Support and execute Reduction of Emissions from Deforestation and Forest Degradation REDD projects that promote sustainable forest management, increase forest carbon stores, and reduce emissions from deforestation and forest degradation.

International Academia Input
Role of Federal Organizations

- Recognize the importance of recovery debt in ecosystem management and restoration, stakeholders should incorporate it into their planning and decision-making procedures.
- Advised to all parties to honor their obligations under international environmental agreements and take concrete steps to effectively implement their provisions.

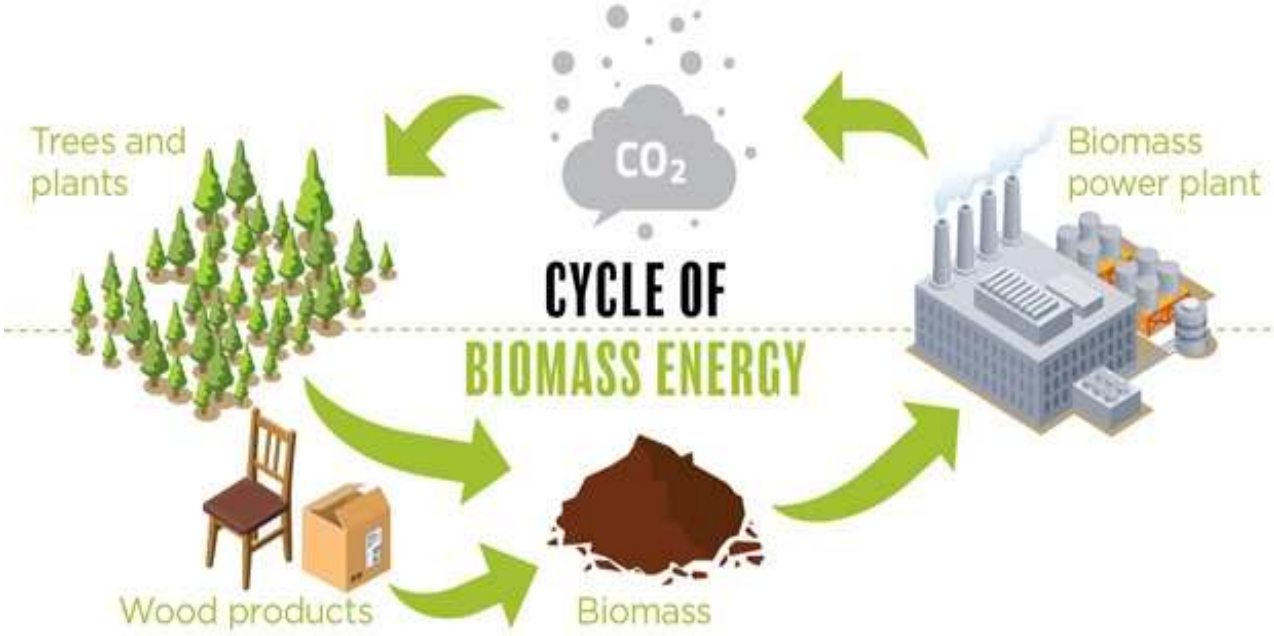


National Academia Input
Private Sector and Local Industry Role

- Make investments in better management or restoration which must also be used to characterize degradation and recovery.
- Promote champion sustainable forestry practices like selective logging and reduced-impact techniques.
- Integrate trees into agricultural systems through agroforestry.
- Collaborate with NGOs and governments on forest conservation initiatives.
- Invest in innovative technologies for efficient resource use and minimizing waste.

International Academia Input
Private Sector and Local Industry Role

- Recommend practitioners, politicians, and community leaders embrace the concept of resilience-based management and prioritize fostering recovery to new, stable, or durable states.
- Diversify livelihoods by promoting ecotourism ventures and sustainable agriculture.
- Monitor and report illegal logging activities to relevant authorities.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Advocate for prioritizing investments in community-based programs and capacity-building activities that enable local communities and indigenous peoples to actively participate in forest management and conservation.
- Raise awareness about the importance of ecosystem balance through campaigns and educational programs.

International Academia Input
NGOs, Humanitarian Resource Enablers

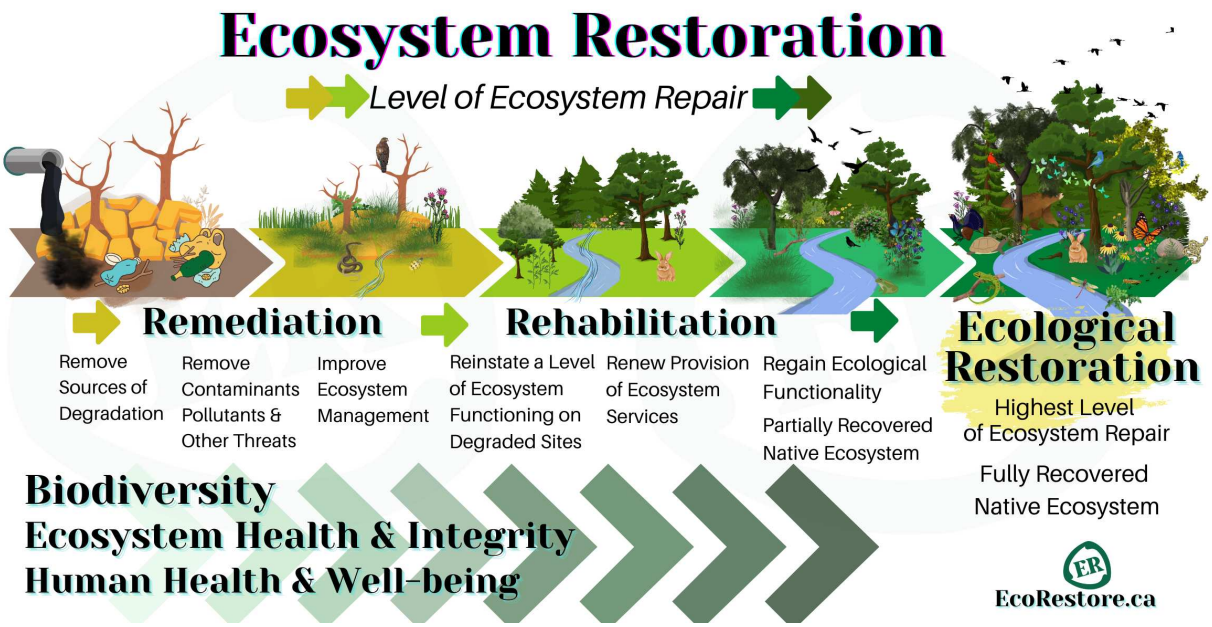
- Fund projects should be aimed at advancing scientific knowledge of forest ecosystems, finding creative answers to problems posed by ecosystem deterioration, and creating adaptive management strategies.
- Advocate for policies that promote sustainable practices and environmental protection.

National Academia Input
Area Academia, Think Tanks

- Reduce degradation and encourage the recovery of ecosystems and landscapes in forest biomes.
- Connect the processes of degradation and recovery and provide strategies for advancing local, regional, and global activities in these areas.
- Develop innovative solutions for habitat restoration, pollution control, and sustainable resource management.
- Pilot new technologies and approaches to test their effectiveness in real-world scenarios.

International Academia Input
Area Academia, Think Tanks

- Measure the biophysical characteristics of deterioration and recovery; nevertheless, the significance of particular characteristics at different scales depends on values that establish preferred states.
- Disseminate research findings through publications, conferences, and online platforms.

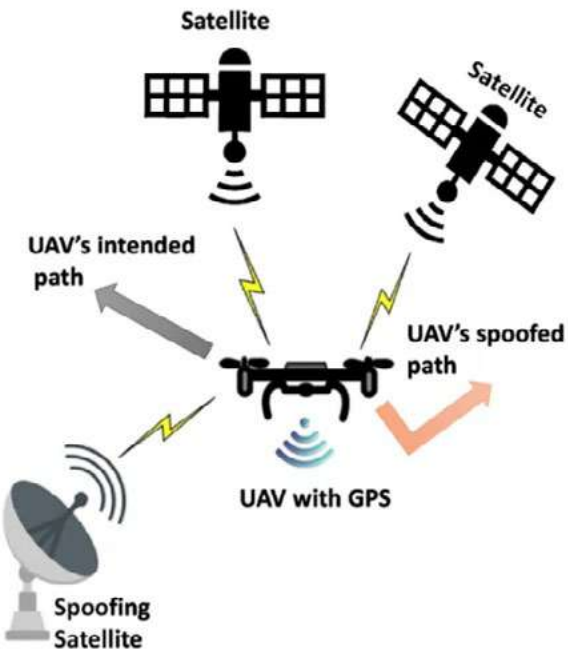


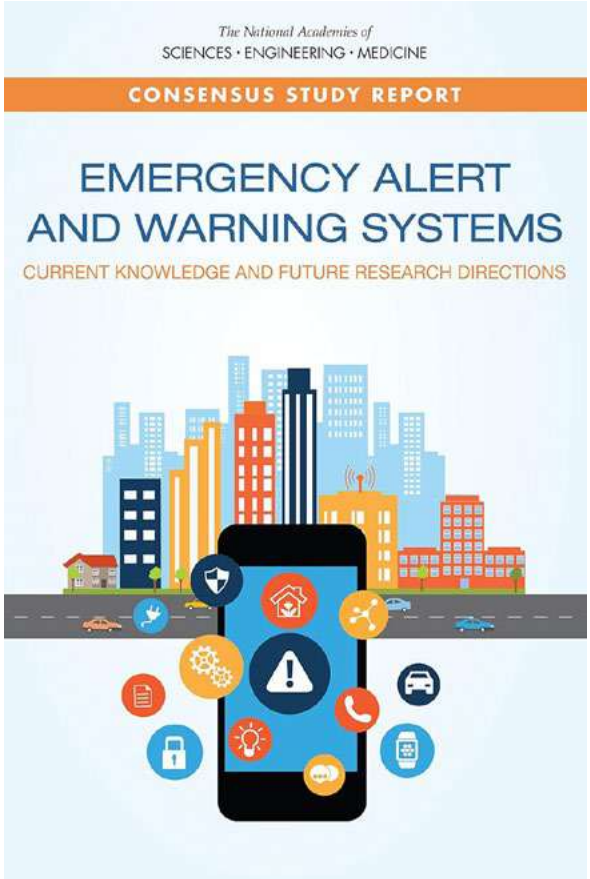
National Academia Input
Local Media and Early Warning Center

- Implement to achieve restoration outcomes that enhance the ecological, social, and economic value of restored landscapes for current and future generations.
- Shine a spotlight on environmental issues like deforestation, pollution, and unsustainable practices.
- Educate the public about the interconnectedness of ecosystems and the consequences of their actions
- Promote stories of successful conservation efforts and inspire community action.
- Organize public forums and discussions to foster dialogue on environmental challenges and solutions.

International Academia Input
Local Media and Early Warning Center

- Restoration projects must combine passive and active methods depending on the potential for natural regeneration in the targeted areas and the costs and benefits of intervention.
- Investigate environmental violations and hold polluters accountable.
- Amplify the voices of scientists, conservationists, and local communities advocating for ecosystem balance.





National Academia Input
Search & Rescue, Law Enforcement

- Improve the efficiency and reliability of deforestation monitoring activities, allowing for proactive actions to reduce forest loss and degradation.
- Law Enforcement should effectively combat illegal logging, prevent land conversion, and reduce forest encroachment.

International Academia Input
Search & Rescue, Law Enforcement

- Governments, organizations, and researchers must work together and share experience when developing and implementing satellite-based monitoring systems.
- Encourage the development and adoption of sustainable certification programmers and supply chain procedures for forest products is essential in combating deforestation
- Promote ethical sourcing and production methods, such as the Roundtable on Sustainable Palm Oil (RSPO) and the Forest Stewardship Council (FSC).

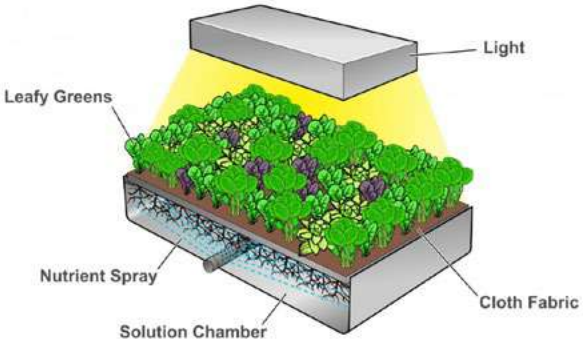
(f) Contingency – Drought, Water Scarcity

National Academia Input
Individual & Community Level

- Create water ponds and storage tanks to preserve fresh water effectively.
- Planting drought resilient crops (sesame), or considering agricultural insurance.
- Actively engage in recharging aquifers and manage both surface water and groundwater resources through conjunctive use for sustainable water management.
- Embrace indigenous practices like Tobas, Kunds, Wells, and Tubewells for sustainable water conservation.

International Academia Input
Individual & Community Level

- Promote ideas of sustainable agricultural practices i.e., Aerofarms including, Hydroponics, Aeroponics and AgX (use of advanced vertical farming techniques indoors with LED lights, using 99% less water than traditional methods, in Abu Dhabi).
- Focus on Agronomic measures (crop management practices such as Mulching), Soil management techniques, Protective barriers, Promoting Agri Voltaic (combining agriculture and solar panels).
- Use carboxymethyl cellulose sodium (CMC-Na) to improve water retention and sand fixation as a control practice.

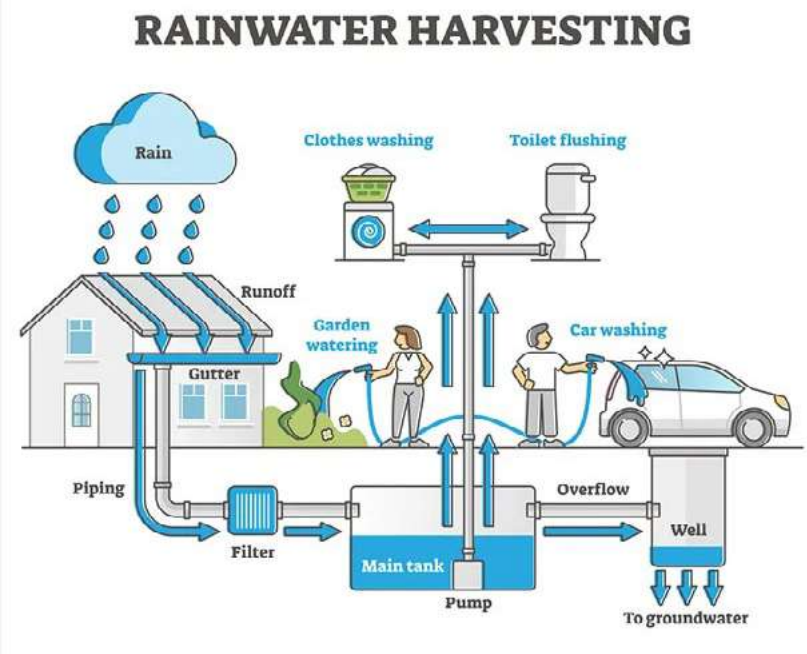


National Academia Input
Area Governance

- Implement design strategies such as the use of resilient materials, thoughtful building design, and geothermal heating/cooling systems.
- Undertake a cost-benefit analysis to assess the inclusion of water scarcity/drought adaptation features.

International Academia Input
Area Governance

- Adopt non-conventional water resources including water harvesting, treated wastewater and water saving irrigation techniques should be adopted.
- Recycle rainwater, integrate wetlands, and utilize terrain for water retention and purification, addressing water scarcity by replenishing groundwater (like China's 'sponge city' initiative).

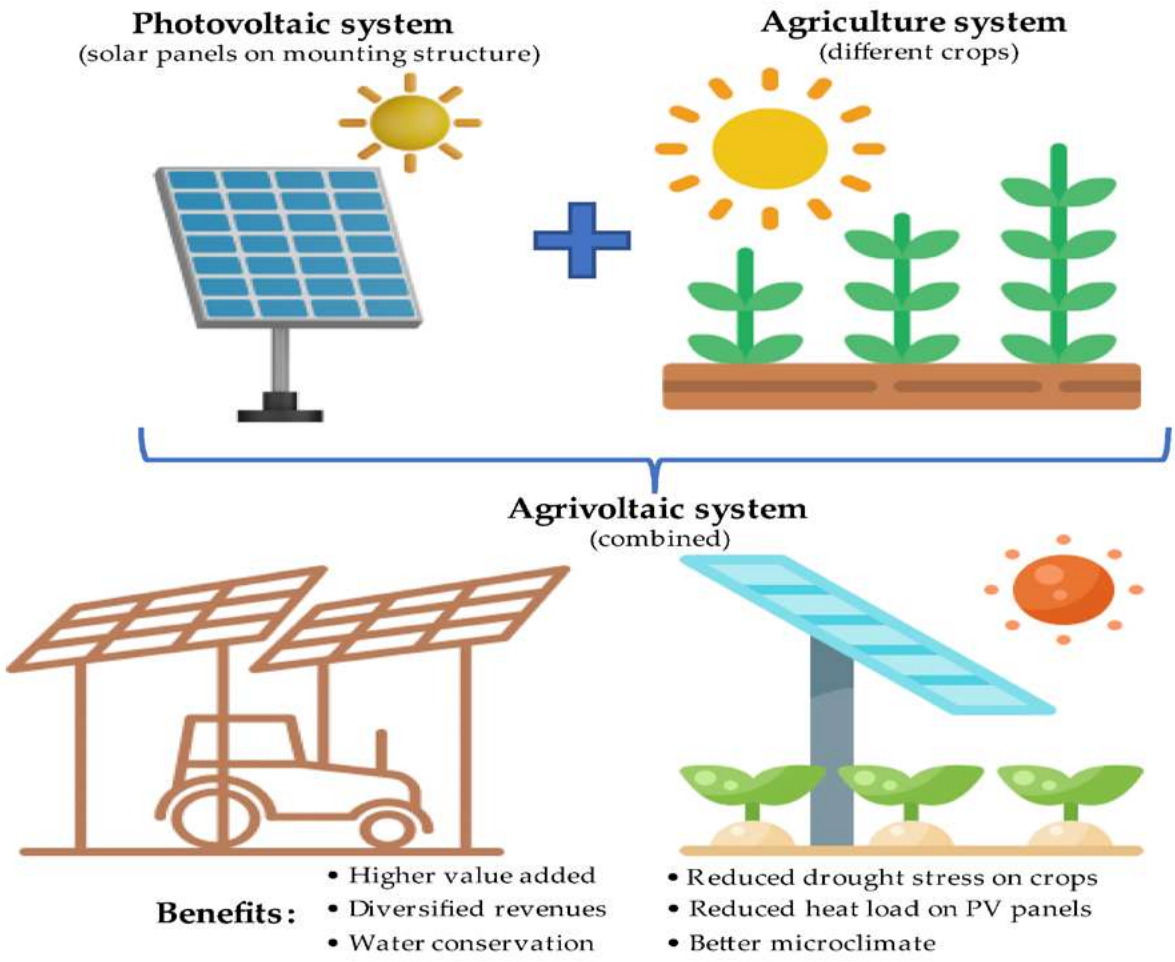


National Academia Input
Role of Federal Organizations

- Implement solar or wind power for agricultural adaptation, incorporating management applications such as crop types and land management.
- Implement of Spate irrigation and localized runoff systems.
- Establish of monitoring systems for (soil, moisture level, and weather conditions).

International Academia Input
Role of Federal Organizations

- Prepare plans and policies related to water management and harvesting.
- Adopt pre-impact governance programs to strengthen resilience, reduce vulnerability and minimize impacts (mitigation).
- Implement Post impact crisis management programs (regarding emergency response procedures).

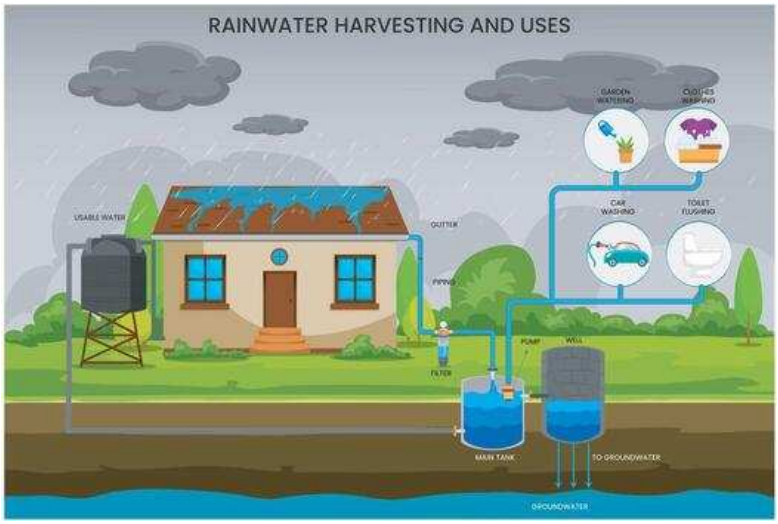


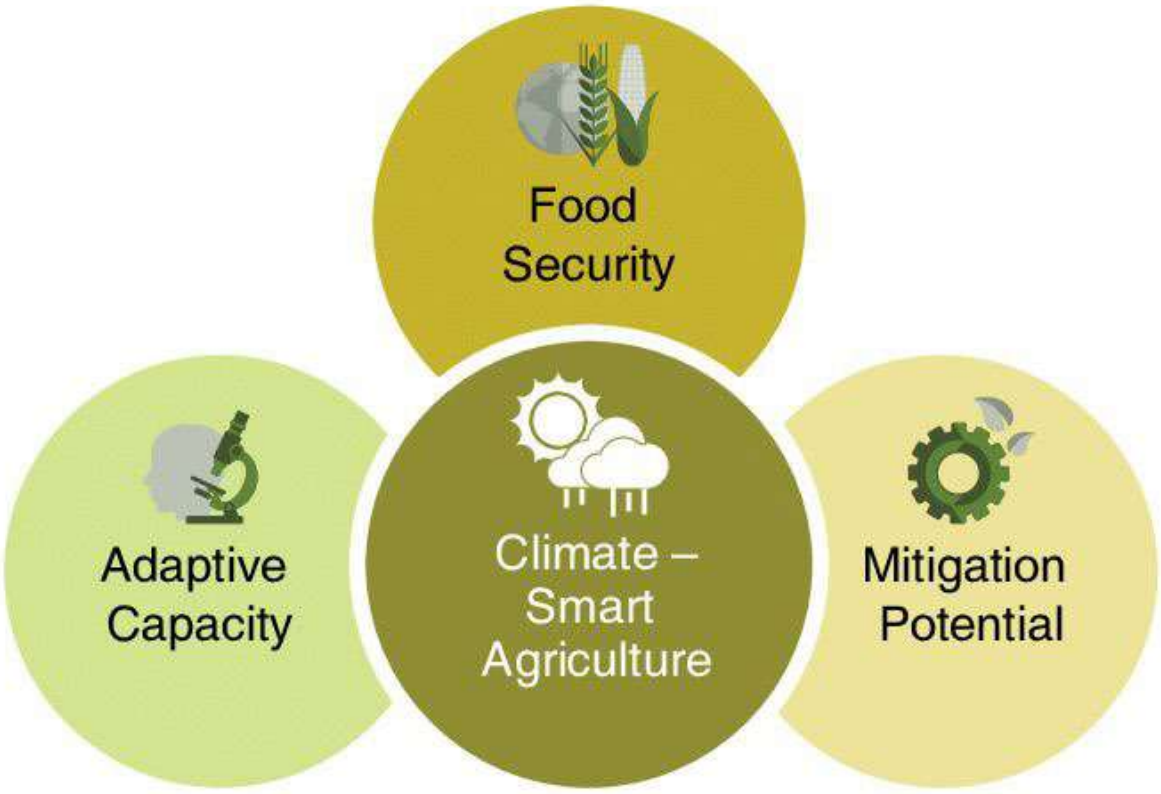
National Academia Input
Private Sector and Local Industry Role

- Use Drought Monitoring and Forecasting Systems (DMFS).
- Begin rainwater harvesting projects in conjunction with ongoing watershed development efforts in desert regions.
- Develop and promote drought-resistant crop varieties.
- Implement water-saving irrigation technologies in agriculture.

International Academia Input
Private Sector and Local Industry Role

- Produce and use of improved seed varieties and livestock breeds.
- Equip farmers with technologies, knowledge, and skills for climate-smart agriculture.
- Optimize industrial water usage through process improvements and recycling.
- Invest in desalination or rainwater harvesting projects to supplement water sources.



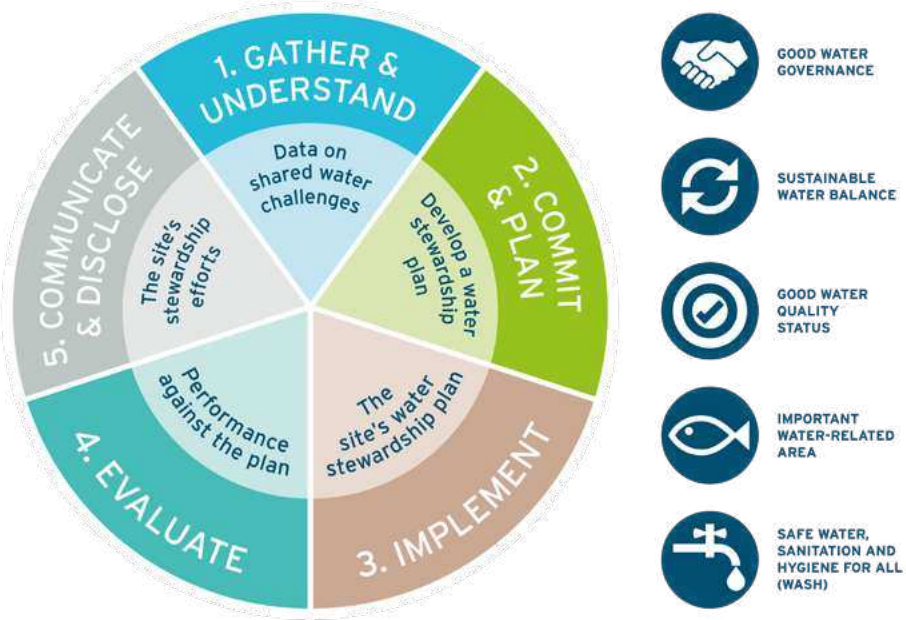


National Academia Input
NGOs, Humanitarian Resource Enablers

- Provide food and water under drought conditions (as ACT Appeal Pakistan Emergency Drought Relief - ASPK01).
- Provide relief in form of food, water, renewable energy and education (AWARE working in Tharparkar region of Sindh).

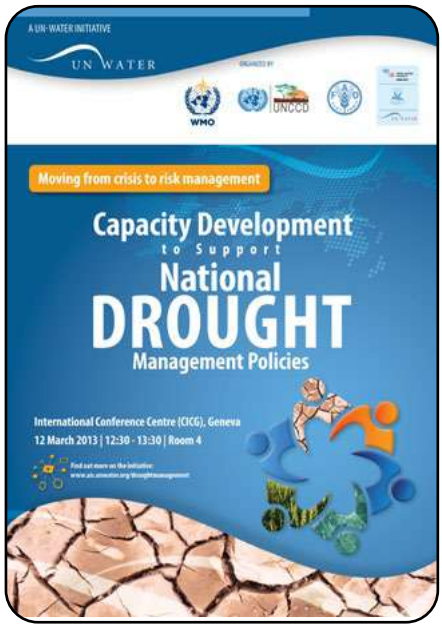
International Academia Input
NGOs, Humanitarian Resource Enablers

- Distribute resilient seeds and cultivate trees and bushes adapted to desert conditions, ensuring reliable food sources for communities. (e.g EDEN project in Niger).
- Promote water management through initiatives like the Alliance for Water Stewardship, advocating for sustainable water use and offering solutions to combat water scarcity (WWF).



National Academia Input
Area Academia, Think Tanks

- Conduct research on efficient irrigation methods, farm layout, balanced use of fertilizers and pesticides.
- Ensure effective water supply via irrigation channels to address water shortages.
- Educate farmers to maximize the benefits of available water sources and optimize water usage once rainfall begins.



International Academia Input
Area Academia, Think Tanks

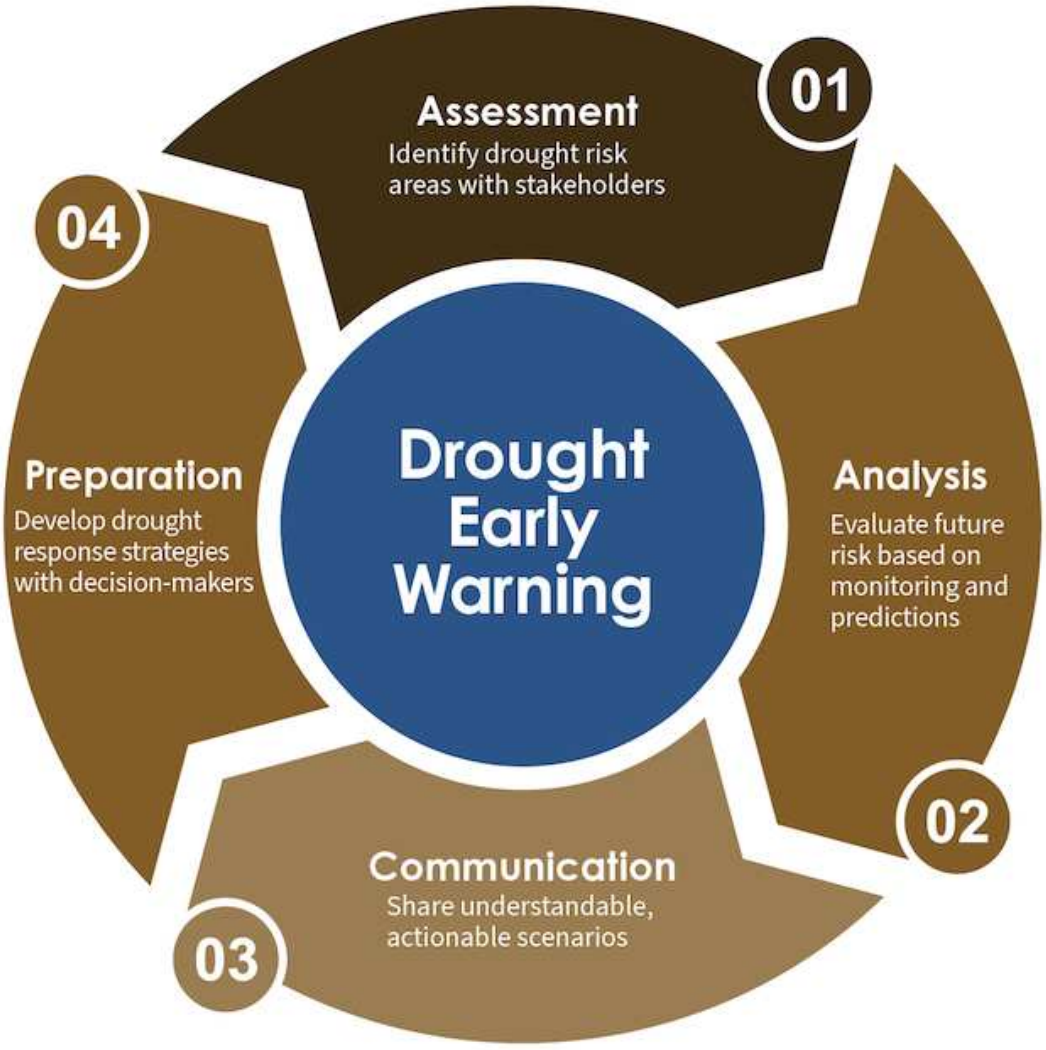
- Use efficient water use technologies such as drip irrigation, laser leveling, raised bed planting.
- Use of traditional zai (small basins used to capture surface runoff), earthen bunds and ridges, fanya juus infiltration pits, contour stone bunds and semi-permeable stone bunds as water harvesting techniques.
- Utilize nylon nets to capture fog, converting it into water droplets, this contraption provides a substantial daily source of 50 to 100 gallons for bathing, washing, and cooking purposes (initiative by Lima).

National Academia Input
Local Media and Early Warning Center

- Ensure the availability of internet access across districts susceptible to drought.
- Local media outlets, including radio, television, newspapers, and online platforms, serve as vital channels for communicating drought-related updates, warnings, and advisories to communities at risk.

International Academia Input
Local Media and Early Warning Center

- Promote media coverage and SMS text alerts.
- Early Warning Centers actively monitor drought conditions, analyze data, and issue timely alerts to relevant stakeholders and decision-makers.
- Collect and analyze meteorological data, drought indicators, and forecasts.
- Provide early warnings of potential drought events, giving communities and authorities crucial time to prepare.



National Academia Input
Search & Rescue, Law Enforcement

- Establish efficient ambulance services for swift transfers of patients from remote villages to major hospitals in urban centers.
- Law enforcement agencies work to prevent illegal activities that can exacerbate drought impacts, such as water theft, environmental violations, and unauthorized land use.

International Academia Input
Search & Rescue, Law Enforcement

- Develop relief programs, including self-help initiatives, for drought-prone regions.
- Design programs to address the specific needs of environmental refugees.
- Mitigate the effects of drought on communities, wildlife, and the environment, ensuring a coordinated response to emergencies and safeguarding public well-being.

(g) Contingency – Wild Fire

National Academia Input
Individual & Community Level

- Foster the informational initiatives that consider local context are likely to be more credible and relevant to individuals.
- Create a culture of cooperation and inclusivity within Joint Forest Management Committees (JFMCs) to assist adjacent forest communities.
- Raise awareness of laws and legislation around forest fires.
- Encourage neighbors to communicate openly and share ideas in order to address concerns and improve understanding of fire dangers.
- Integrate community participation in Forest Fire Management (IFFM) model.

International Academia Input
Individual & Community Level

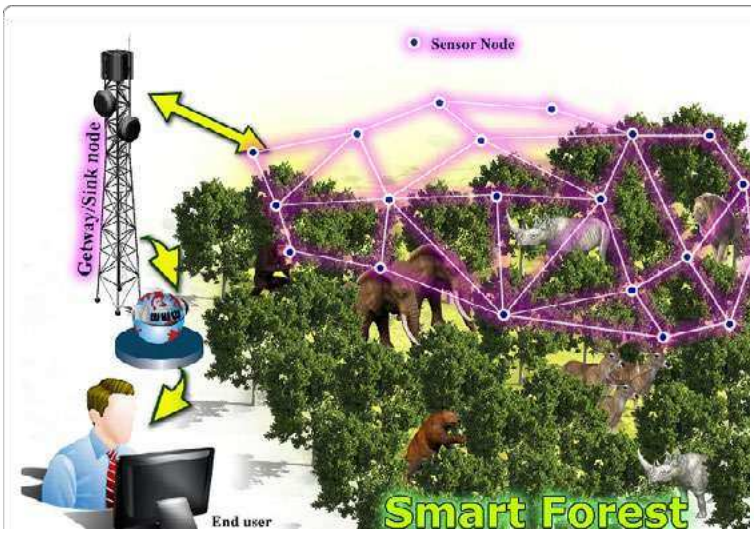
- Raise awareness about the immediate and indirect effects of forest fires on communities.
- Raise awareness of communities' roles and responsibilities in forest fire management.
- Actively participate in forest fire prevention and suppression actions.
- Mandatory evacuation plans can help limit the number of people affected by wildfires in areas where they are more likely to occur.
- The forest Fire Prevention Training Module should be replicated in Pakistan as introduced by Indonesia.

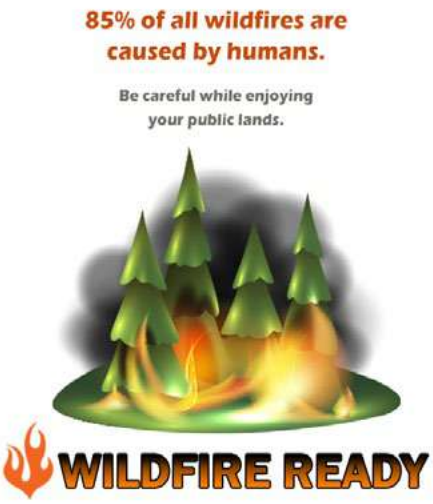
National Academia Input
Area Governance

- Use the collected data through the daily reporting system (DSRs) to conduct a thorough study and detect trends in forest fires, such as frequency, severity, causes, and affected areas.
- Conduct detailed assessments to determine which plant species are prone to igniting fires. Remove these plants from high-risk regions to lessen the likelihood of wildfires.
- Increase enforcement methods to ensure compliance with the restriction on forbidden activities and products in forest fire zones.
- Implementing the Fire Incidents Rapid Response Team (FIRRT) approach, can reduce the damaging effects of forest fires.

International Academia Input
Area Governance

- Globally, governments strike a balance between funding fire suppression and efforts to avert wildfires, such as cutting fuel loads and re-establishing natural fire cycles in ecosystems.
- Implement or scaled-up proven practices and tools such as fire monitoring watch towers and early detection, fire danger rating, and asset vulnerability management such as through buffer zones and the adoption of codes and standards.
- Encourage to support the formation and strengthening of Fire Protection Associations as a crucial instrument for wildfire management and risk reduction.
- The Fire-Smart program, which attempts to lessen the risk wildfires cause to people and structures, is one important wildfire initiative in Canada.





National Academia Input
Private Sector and Local Industry Role

- Insurance companies must ensure a culture of fire safety.
- Advanced technology for early detection and monitoring of forest fires can be developed and used by private enterprises.
- Implement sustainable supply chain strategies to reduce the likelihood of forest fires.

International Academia Input
Private Sector and Local Industry Role

- Globally, forest wildfire detection systems should be used.
- Through brush removal, forest thinning, and vegetation management techniques, sectors like logging, agriculture, and land development contributed to the fight against fuel.
- During wildfire events, local enterprises should supply trained individuals, machinery, and equipment to aid in the fight against fires.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Create a framework, called the "Pakistan Wildfire Framework," to combine AI solutions with existing forest fire management procedures.
- Encourage practices of forestation and sustainable management that increase carbon sequestration while mitigating the consequences of climate change.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Apply the science-based methods for wildfire control and mitigate.
- Collaborate across local, state, and federal organizations for fire mitigation.

National Academia Input
Area Academia, Think Tanks

- Provide firefighters with critical situational knowledge even in unexpected locations, helping them to maneuver effectively and prioritize responses.
- Adopt the practice that likelihood of fire-related tragedies in urban environments can be significantly decreased by addressing fire threats at their source.
- Entrepreneurs must engage in genuine communication with indigenous people to better understand their viewpoints and needs.

International Academia Input
Area Academia, Think Tanks

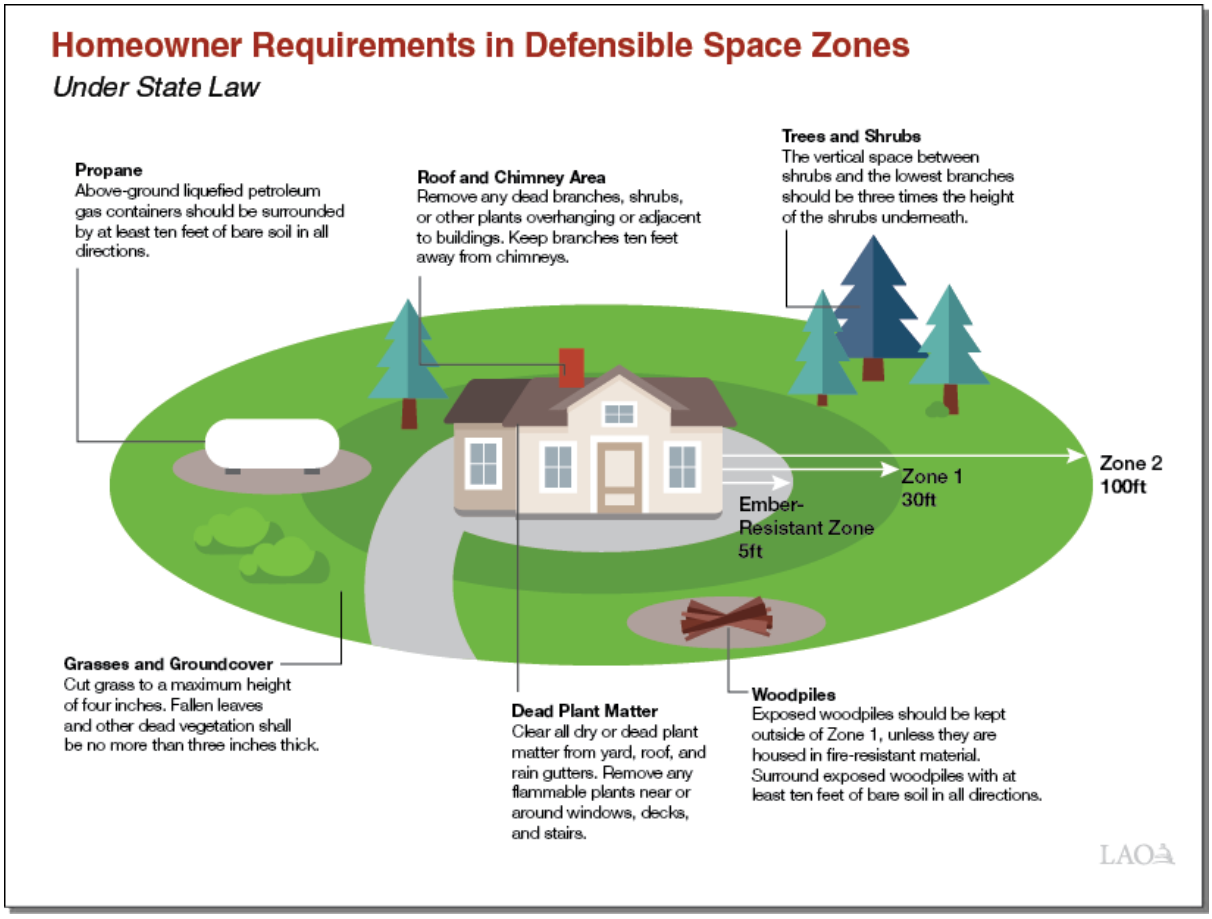
- Provide data-driven insights to support future urban planning initiatives and provide better infrastructure for emergency response teams.
- The government and law enforcement institutions also focus on the area around buildings that should be cleared of vegetation.
- Policies for risk minimization and intersectoral cooperation are part of regional fire management strategies.

National Academia Input
Local Media and Early Warning Center

- Forest Fire Management Teams (FFMTs) must be in charge of making sure that all applicable evacuation, communication, and fire safety procedures are carried out.
- In metropolitan regions, building control regulations must be immediately followed, and buildings must be made accessible to firefighters by allowing room for their mobility throughout construction.
- Build Defensible spaces between the building and the vegetation or any wild area that surrounds it.
- Advanced fire detection systems are used in high-risk regions.

International Academia Input
Local Media and Early Warning Center

- The skidding lanes should install in higher-risk places, roads for emergency access should be modified or built.
- Incorporate pre-established fire control lines, buffer zones (which reduce the amount, kind, and density of vegetation), and other safety precautions.



National Academia Input
Search & Rescue, Law Enforcement

- Provide timely responses to fire situations by efficient dispatch and deployment of Rescue 1122 fire crews.
- Deception and outright theft of forest products should be considered forestry transaction crimes.
- The conservation of biodiversity and representative ecosystems requires a participatory approach involving all stakeholders.
- Efforts should be made to evaluate the state of the forests, watersheds, and rangelands.
- Local governments must work with water and power companies to build stronger systems to prevent the loss of electricity, heat and running water over longer periods of time.

International Academia Input
Search & Rescue, Law Enforcement

- Follow forest protection laws.
- Good Neighbor Authority (GNA) allows State foresters to help understaffed Federal agencies design forest restoration treatments.
- Wood from western forests can be used and recycled in countless ways while restoring forests to a sustainable condition and reducing wildfire hazard.
- The country's health awareness campaigns and safety precautions for the upcoming forest fire season should be promoted.

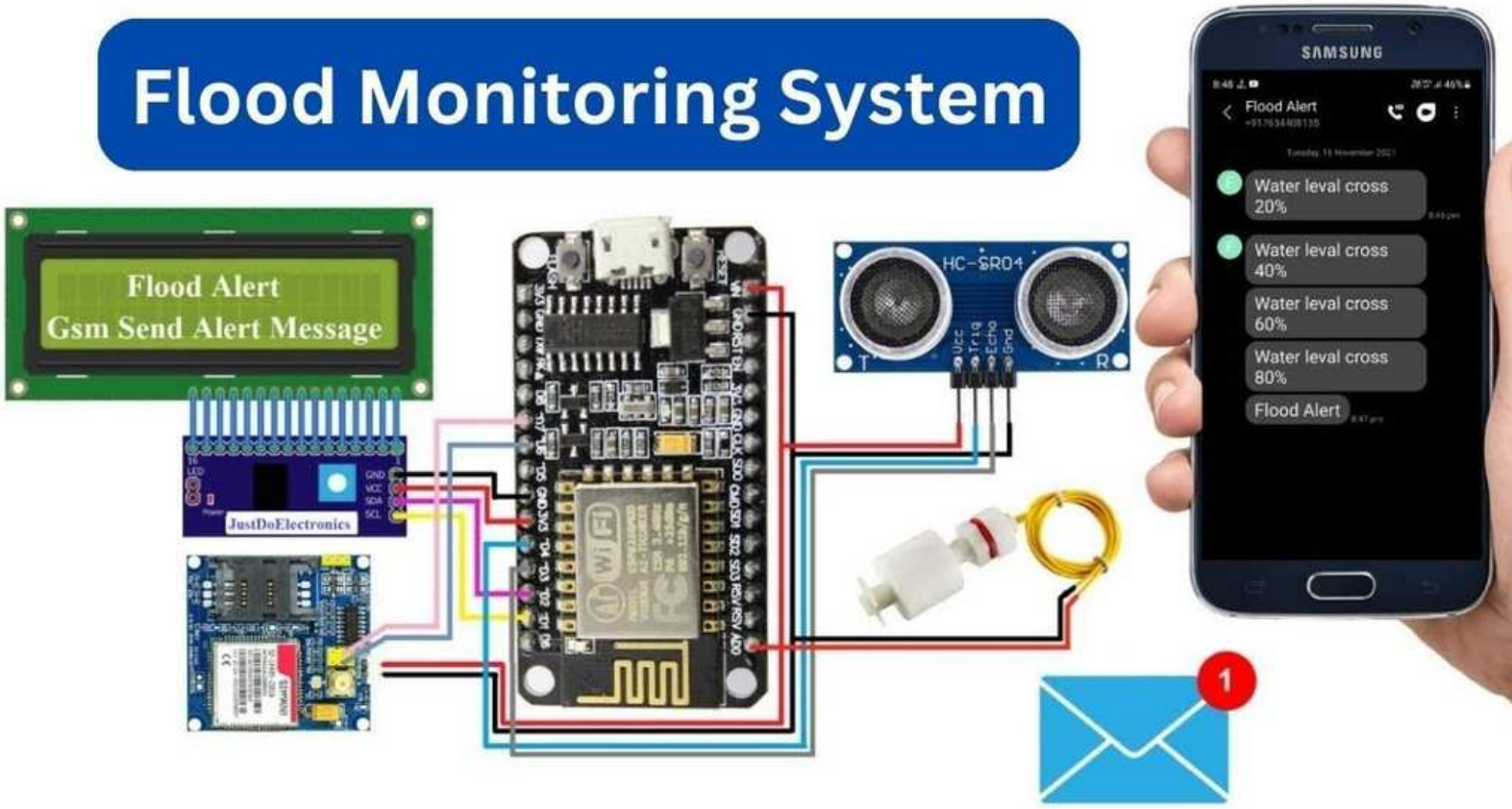
(h) Contingency – Riverine Flood

National Academia Input Individual & Community Level

- Use digital platforms, mobile apps, and SMS-based systems that provide real-time flood alerts, forecasts, and risk maps to stay informed and prepared.
- Invest in household-level green infrastructure such as rain gardens, permeable pavements, and water storage systems to manage excess rainwater.
- Retrofit homes with flood-resilient materials and locally appropriate technologies to minimize damage in flood-prone areas.
- Promote access to affordable flood insurance and digital comparison tools to improve financial protection, especially in developing countries.
- Implement community-based flood risk education programs, focusing on children, the elderly, and other vulnerable groups

International Academia Input Individual & Community Level

- Establish local volunteer groups for evacuation, relief distribution, and post-flood recovery support.
- Strengthen cross-border early warning cooperation in regions sharing river basins..
- Encourage micro-insurance schemes to reduce financial vulnerability among low-income households.

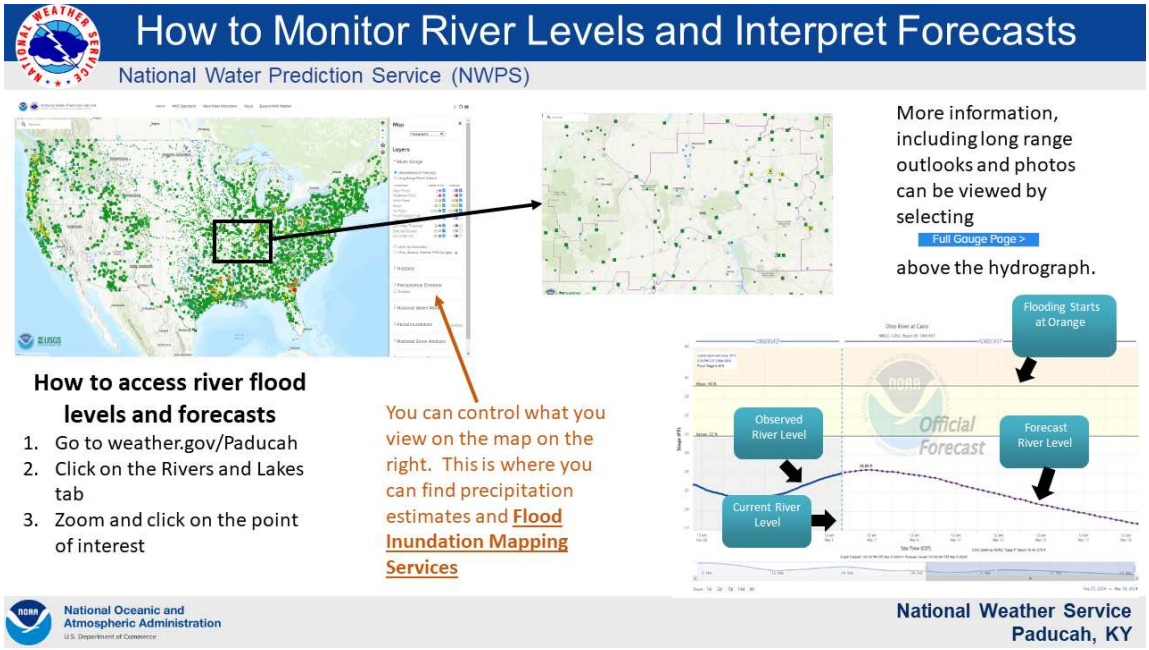


National Academia Input
Area Governance

- Develop comprehensive flood management strategies that combine structural (levees, dams) and non-structural measures (zoning, awareness).
- Implement Nature-based Solutions (NbS), including wetland restoration and floodplain preservation, to enhance natural water retention.
- Strengthen watershed-level planning and promote transboundary river basin cooperation for joint monitoring and coordinated response.
- Establish robust Flood Early Warning Systems (FEWS) supported by advanced forecasting technologies and real-time data platforms.

International Academia Input
Area Governance

- Integrate climate change adaptation into national and regional flood management plans.
- Create Urban River Management Plans (URMPs) to address river sustainability in rapidly growing urban areas.
- Improve coordination among government agencies and invest in capacity-building for flood management professionals.

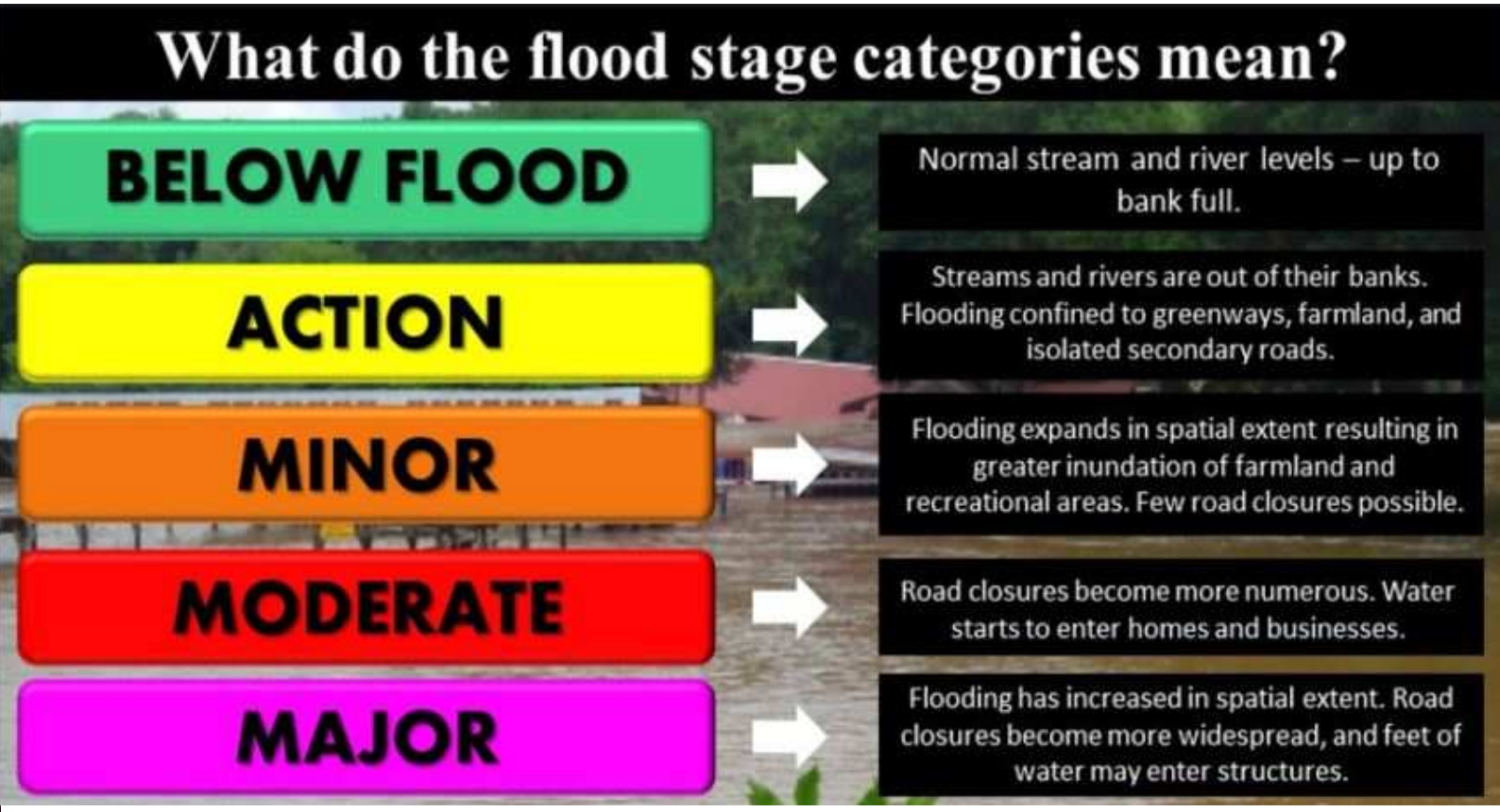


National Academia Input
Role of Federal Organizations

- Develop and regularly update national flood risk maps to guide planning, infrastructure investment, and zoning regulations.
- Implement nationwide monitoring and early warning systems integrated with regional and global platforms.
- Enforce consistent building codes and land-use regulations that reduce flood exposure and vulnerability.
- Lead and coordinate multi-agency flood response operations during emergencies.

International Academia Input
Role of Federal Organizations

- Allocate funding for resilient infrastructure, flood prevention programs, and climate impact research.
- Support international collaboration through data sharing, joint research, and assistance to developing nations.
- Promote standardized flood management frameworks and best practices globally

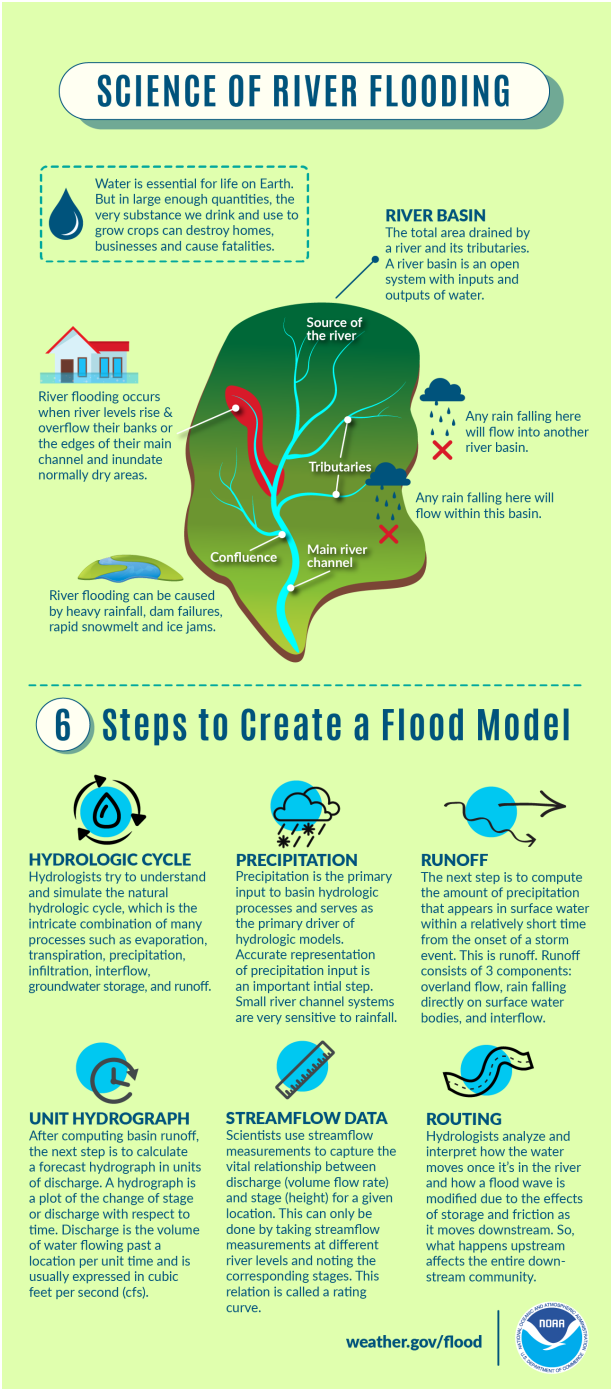


National Academia Input
Private Sector and Local Industry Role

- Conduct regular flood risk assessments to protect assets, operations, and supply chains.
- Invest in flood-resilient infrastructure and retrofit existing facilities to withstand extreme events.
- Collaborate with public authorities to support early warning systems and community preparedness initiatives.
- Diversify supply chains and implement contingency plans to reduce business disruption.
- Adopt sustainable water management and drainage practices in industrial operations.

International Academia Input
Private Sector and Local Industry Role

- Encourage innovation in flood-resistant construction materials and technologies.
- Participate in public-private partnerships (PPPs) to fund large-scale flood mitigation projects.
- Contribute to disaster relief, recovery, and rebuilding efforts through corporate social responsibility programs.

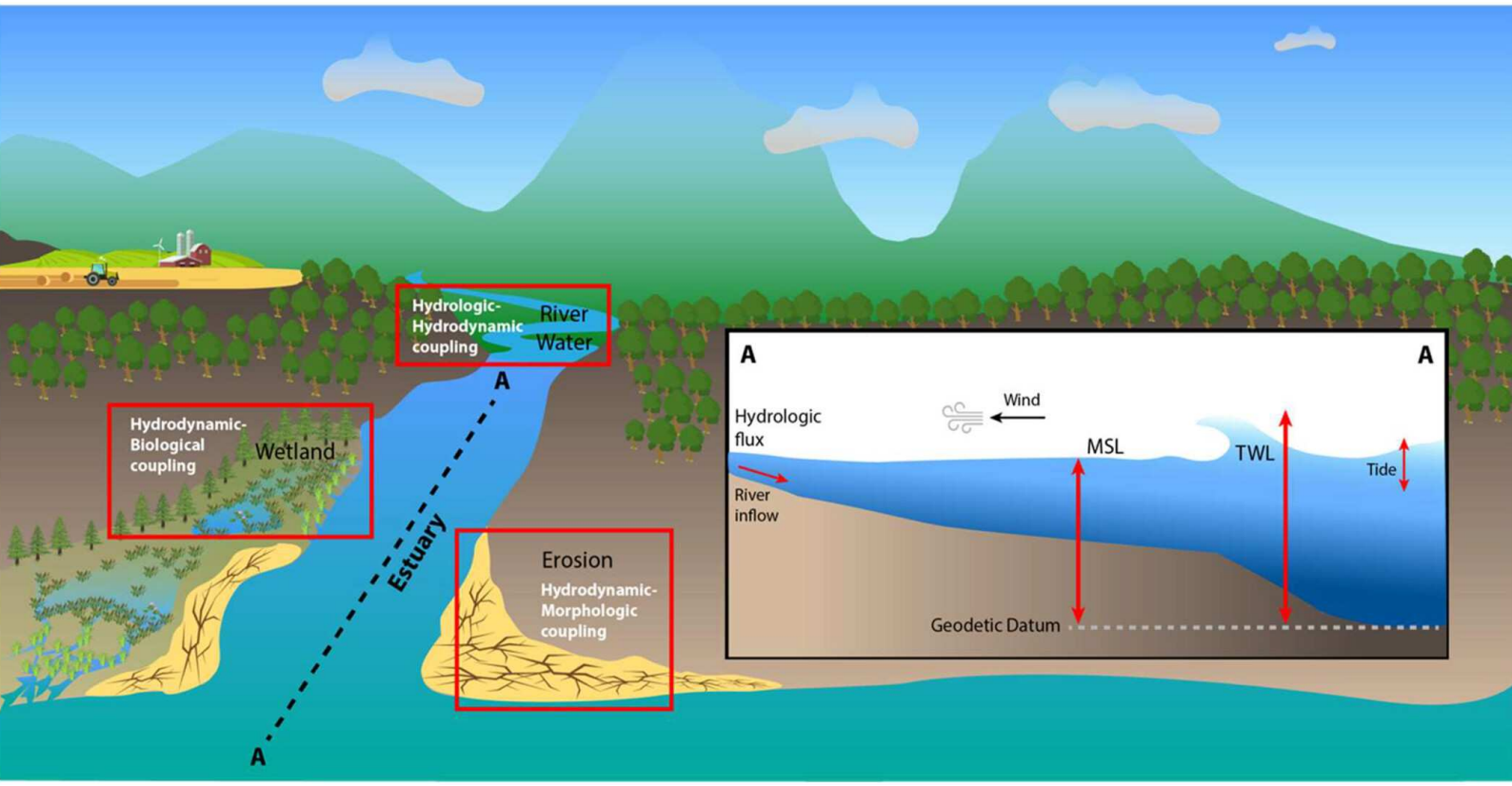


National Academia Input
NGOs, Humanitarian Resource Enablers

- Adopt holistic flood risk reduction strategies that integrate prevention, preparedness, response, and recovery.
- Engage communities in participatory flood risk mapping and decision-making processes.
- Develop accessible early warning systems tailored to at-risk and marginalized populations.
- Promote flood-resilient housing and infrastructure solutions in vulnerable communities.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Train local leaders and volunteers in emergency response and disaster risk reduction.
- Support nature-based and sustainable land-use practices to reduce long-term flood risks.
- Facilitate coordination between governments, donors, and communities to streamline response efforts.

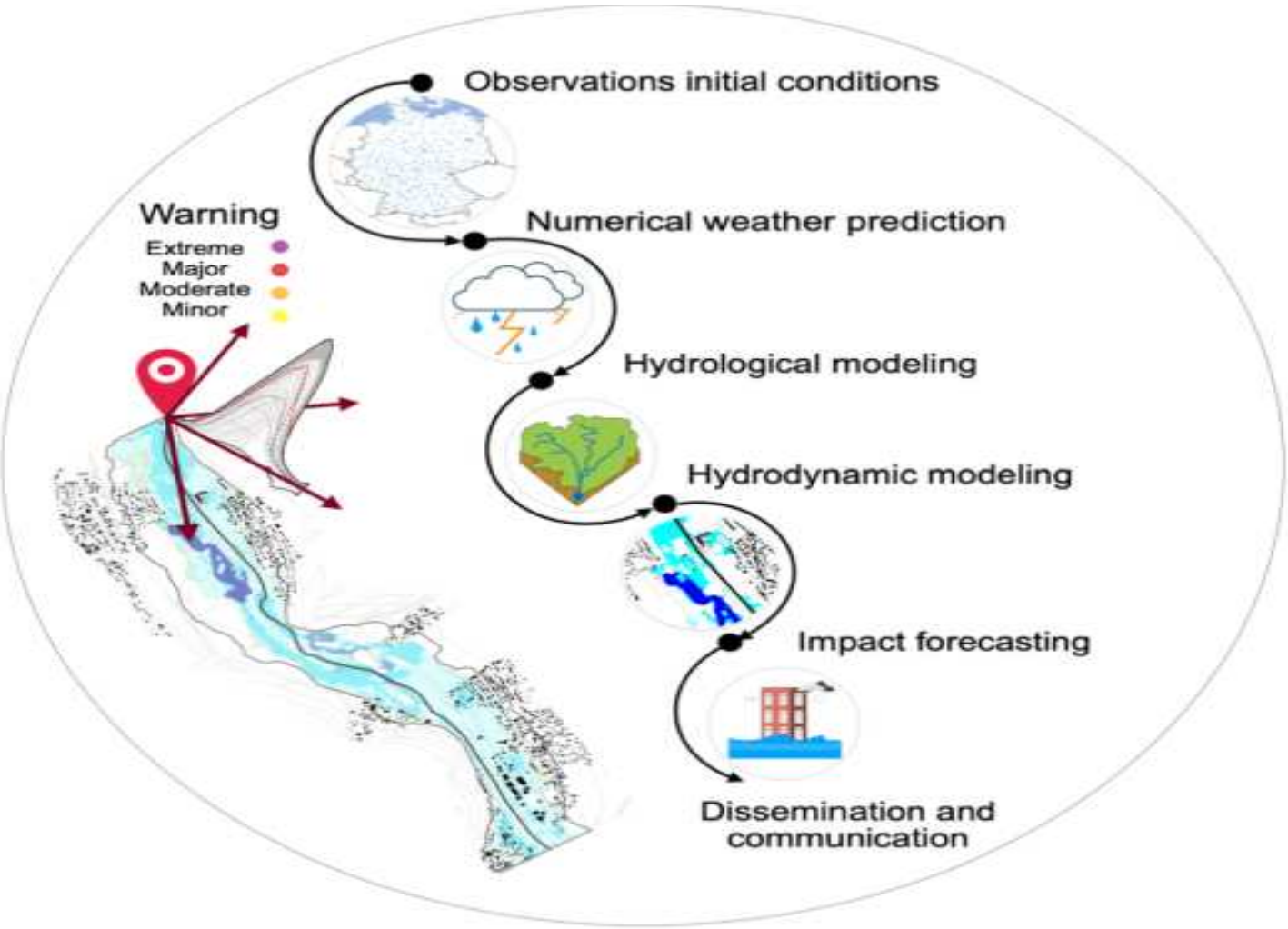


National Academia Input
Area Academia, Think Tanks

- Conduct research on riverine flood patterns, climate change impacts, and effective mitigation strategies.
- Develop and refine predictive models and advanced flood forecasting tools.
- Contribute to the standardization of global flood forecasting and risk assessment systems.
- Provide training and academic programs in flood risk management and climate resilience.

International Academia Input
Area Academia, Think Tanks

- Foster interdisciplinary collaboration across engineering, environmental science, and urban planning fields.
- Publish evidence-based best practices to inform policymakers and industry leaders.
- Engage communities through outreach programs focused on awareness and preparedness.



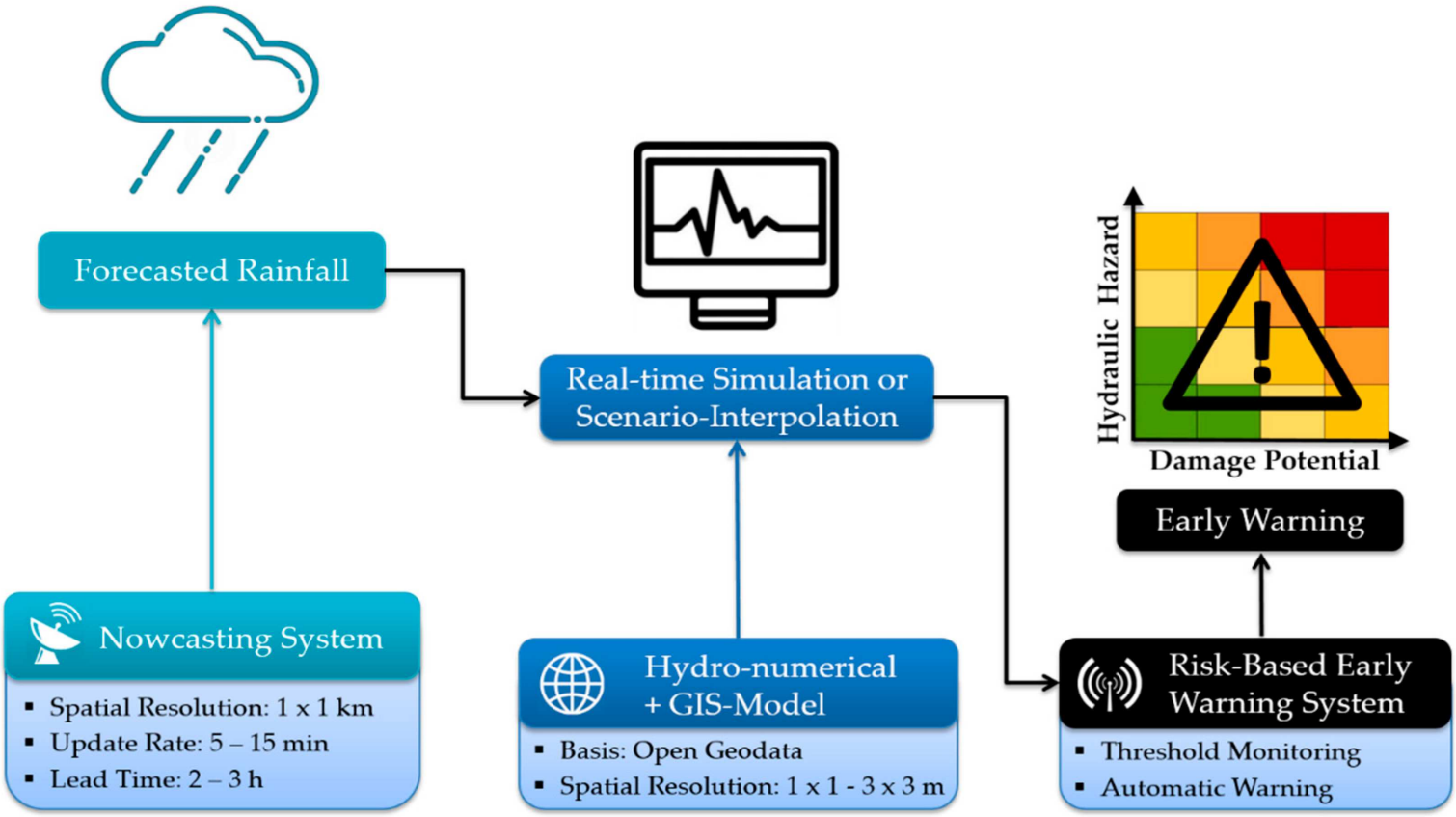
Model/characteristic	Daily updates	Technology readiness level	Spatial Resolution	Ensemble member
Numerical weather prediction	1 - 8	7 - 9	1 - 4 km	10 - 51
Hydrological forecasting	1 - 8	7 - 9	100 m - 5 km	10 - 51
Hydrodynamic modeling and impact forecasting	Not yet operationalized	4 - 6	1 - 10 m	-

National Academia Input
Local Media and Early Warning Center

- Establish and maintain local flood monitoring systems that provide regular public updates.
- Operate localized early warning systems delivering real-time alerts through multiple communication channels.
- Conduct public awareness campaigns on flood risks, preparedness measures, and safety protocols.
- Ensure clear, consistent messaging via radio, television, SMS, and social media platforms.
- Establish community feedback mechanisms (hotlines, social media monitoring, local reporters) to gather real-time ground information and improve the effectiveness of warning and response communication systems.

International Academia Input
Local Media and Early Warning Center

- Coordinate with national and international forecasting networks for cross-border alerts.
- Support emergency communication systems during major flood events.
- Develop partnerships with local authorities, meteorological agencies, and disaster management institutions to ensure accurate, verified, and timely dissemination of flood information.



National Academia Input
Search & Rescue, Law Enforcement

- Establish national or regional command centers to coordinate flood response operations.
- Provide regular training and modern equipment (boats, drones, medical kits) to rescue teams.
- Deploy rapid response units to flood-affected areas to minimize casualties and damage.
- Strengthen cross-border collaboration for large-scale or transboundary flood events.
- Train law enforcement personnel in evacuation management and public safety during disasters.

International Academia Input
Search & Rescue, Law Enforcement

- Enforce evacuation orders, safety regulations, and emergency protocols to protect affected populations.
- Develop integrated incident command systems that ensure clear leadership, defined roles, and seamless coordination among emergency services, military units, medical teams, and local authorities during flood operations.
- Conduct regular simulation exercises and joint drills at local, national, and cross-border levels to test preparedness, improve interoperability, and identify gaps in flood response capacity.

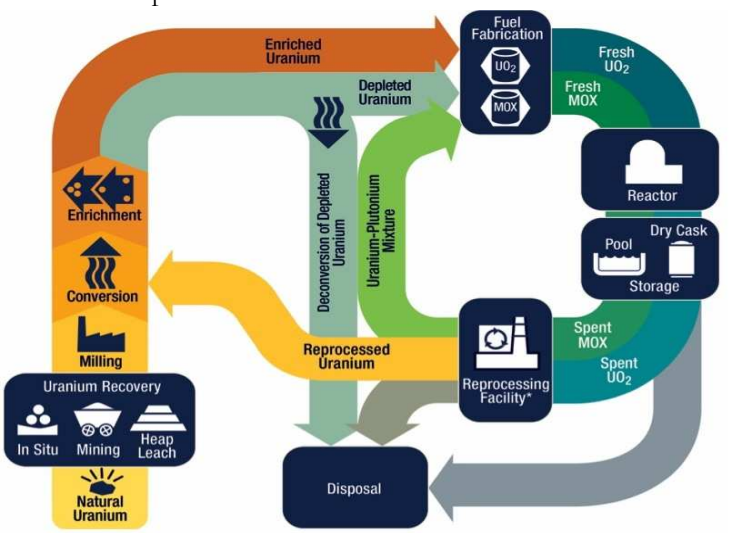
(i) Contingency – Nuclear Hazards

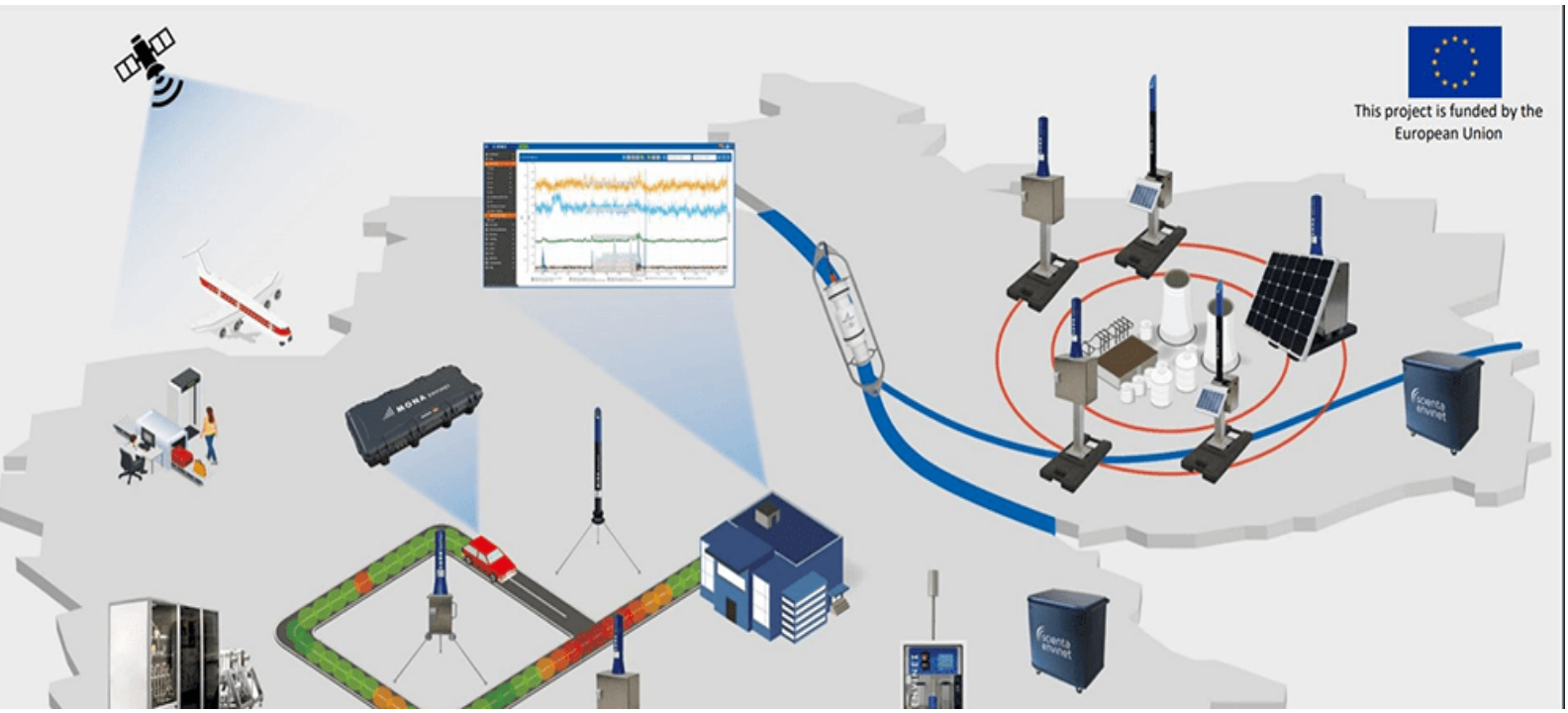
National Academia Input Individual & Community Level

- Provide comprehensive training to all personnel in nuclear facilities Participate in Community drills
- Encourage nuclear safety awareness, the creation of local preparedness groups, and clear communication with nuclear facilities.
- Familiarize yourself with local emergency contact numbers and communication protocols.

International Academia Input Individual & Community Level

- Follow local guidelines for disposing of such items properly to avoid contamination.
- Keep an Emergency Kit like adding potassium iodide tablets, as they can protect the thyroid from radiation exposure in case of a nuclear incident





National Academia Input
Area Governance

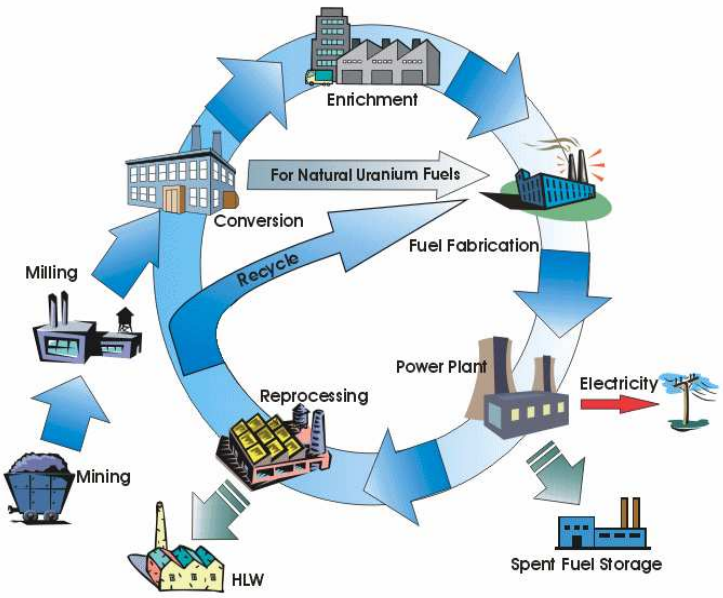
- Educate the public about nuclear risks, safety protocols, and evacuation procedures to increase awareness and preparedness Establish clear, detailed emergency response plans tailored to the specific nuclear risks in the area
- Create a reliable communication plan to keep residents informed. This could include text message alerts, sirens, or a dedicated radio station to disseminate information in the event of an emergency.
- Install radiation monitoring systems around nuclear facilities and in surrounding areas to detect any increases in radiation levels

International Academia Input
Area Governance

- Set and enforce local standards for waste management and emissions from nuclear facilities. Implement strict zoning regulations to control land use around nuclear facilities.
- Set up communication networks for disseminating timely and accurate information to the public and stakeholders. Deploy measures to prevent radioactive contamination from spreading, such as sealing leaks and deploying containment booms.

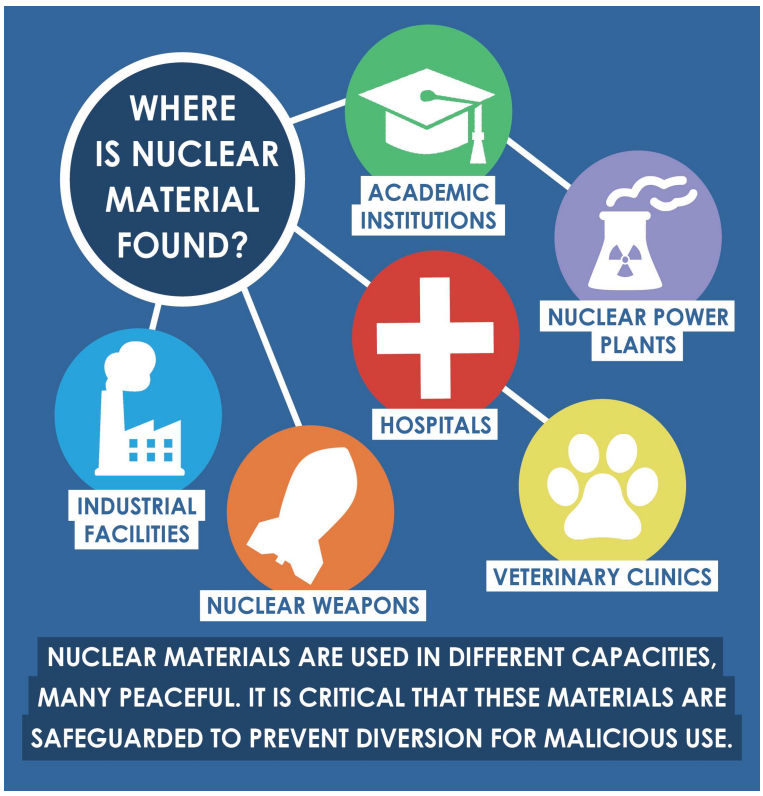
National Academia Input
Role of Federal Organizations

- Establish and enforce strict safety standards for nuclear facility construction, operation, and decommissioning.
- Fund R&D in advanced nuclear safety technologies, including accident-tolerant fuels and improved containment systems.
- Promote deployment of Generation III+ and Generation IV reactors with passive safety features.
- Create strong coordination frameworks between federal, state, and local authorities.
- Maintain specialized, well-equipped national rapid response teams for nuclear incidents.
- Implement digital twin systems for real-time monitoring and predictive maintenance.



International Academia Input
Role of Federal Organizations

- Enforce rigorous decommissioning protocols for aging plants.
- Deploy robotics and drones for inspection in high-radiation environments.
- Conduct regular national emergency drills and stress tests.
- Strengthen independent regulatory oversight and compliance audits.

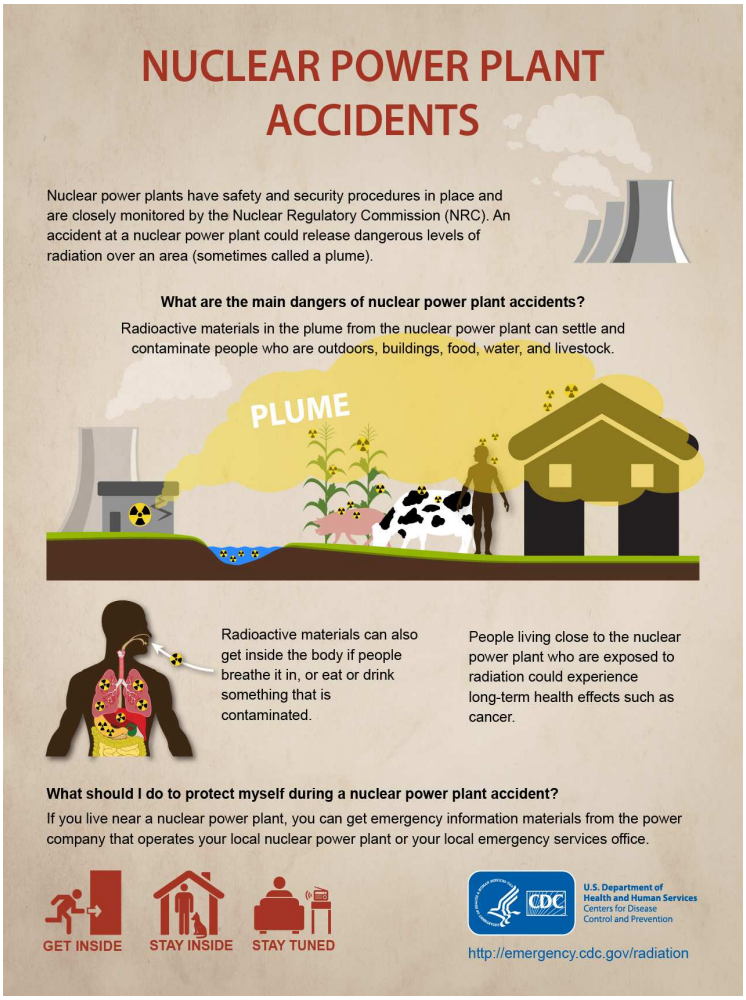


National Academia Input
Private Sector and Local Industry Role

- Align operations with international nuclear safety standards such as those of the International Atomic Energy Agency (IAEA).
- Maintain backup systems and engineered fail-safes to reduce accident risks.
- Share safety insights while balancing operational confidentiality.
- Strengthen emergency communication and IT systems resilience.

International Academia Input
Private Sector and Local Industry Role

- Use logistics networks for rapid delivery of emergency supplies.
- Manufacture protective equipment, radiation shielding, and decontamination materials.
- Invest in continuous safety training and risk assessments.
- Participate in public-private emergency preparedness partnerships.
- Adopt advanced monitoring and anomaly detection technologies.

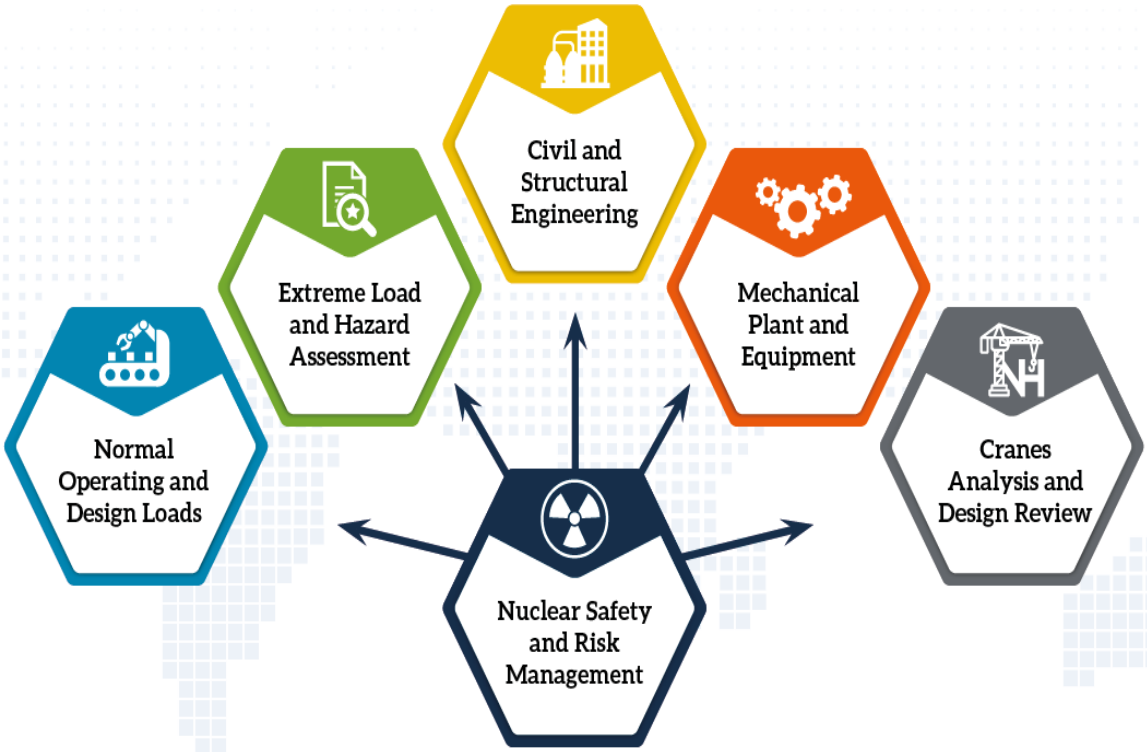


National Academia Input
NGOs, Humanitarian Resource Enablers

- Support community recovery through economic and social assistance programs.
- Prioritize restoration of critical infrastructure and essential public services.
- Mobilize funding, relief supplies, and technical support in coordination with governments.
- Establish mobile medical units and provide emergency healthcare services.
- Assist displaced populations with shelter, compensation, and legal entitlements.
- Conduct independent needs assessments and damage evaluations to guide evidence-based recovery and resource allocation.
- Support environmental monitoring and community-based radiation awareness initiatives to reduce long-term health and ecological risks

International Academia Input
NGOs, Humanitarian Resource Enablers

- Provide psychosocial support and community counseling services.
- Facilitate long-term rehabilitation and livelihood restoration programs.
- Promote inclusive recovery planning involving affected communities.
- Advocate for transparency, accountability, and equitable distribution of aid to ensure vulnerable and marginalized groups are not excluded from recovery efforts.

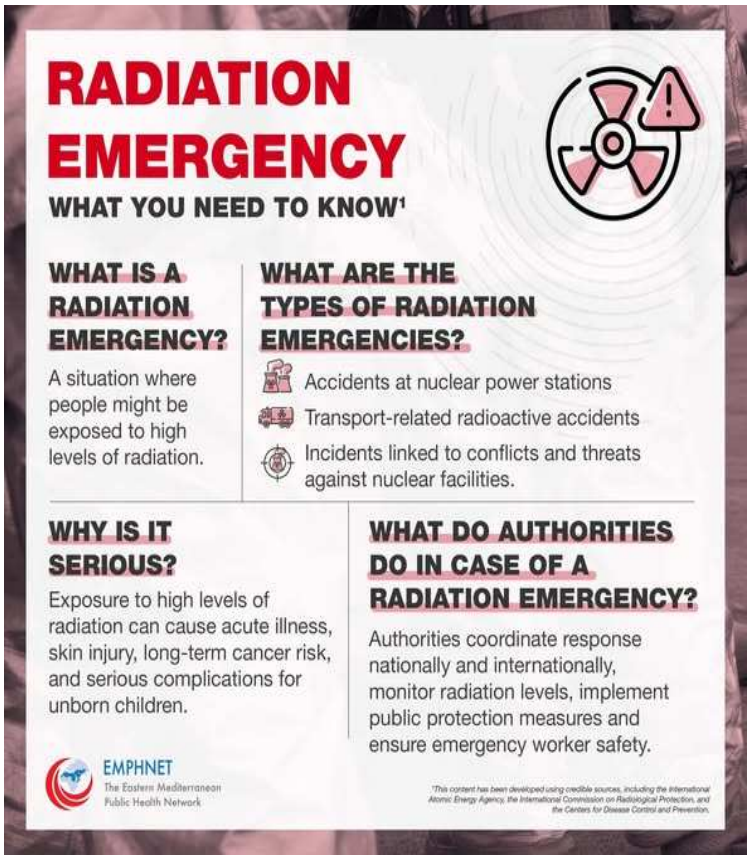


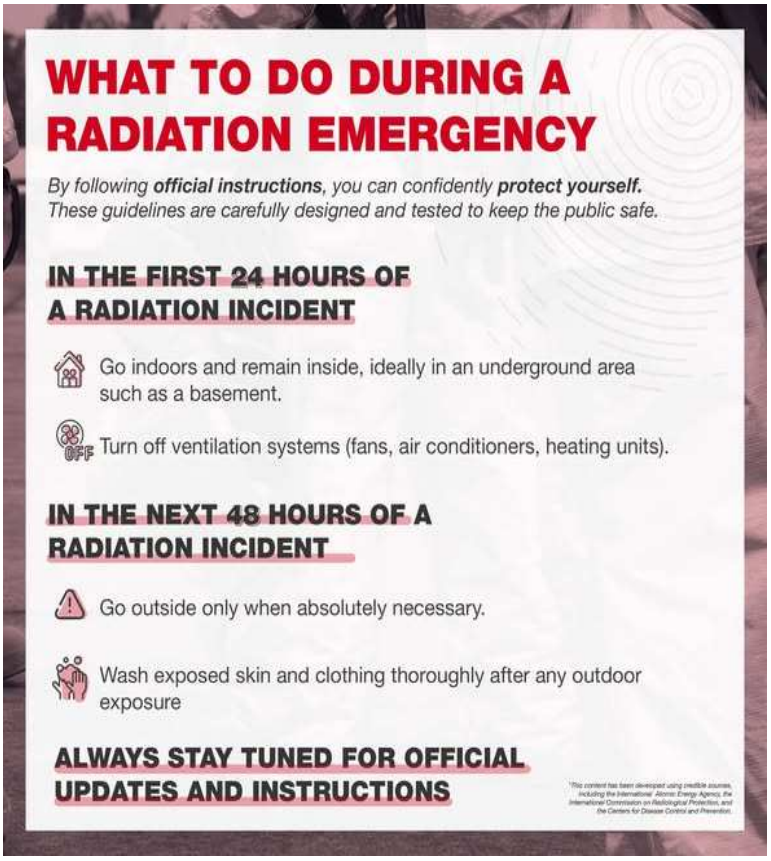
National Academia Input
Area Academia, Think Tanks

- Conduct research on advanced and safer reactor technologies.
- Develop AI-based monitoring and early anomaly detection systems.
- Train nuclear engineers, radiation specialists, and emergency planners.
- Promote transparency, accountability, and independent regulation.
- Collaborate internationally to share safety research and data.
- Design cross-border nuclear emergency response frameworks.
- Provide policy advisory support to governments and international bodies on nuclear safety governance and emergency preparedness strategies.

International Academia Input
Area Academia, Think Tanks

- Support innovation in waste management and decommissioning techniques.
- Publish evidence-based safety guidelines for policymakers.
- Organize simulation exercises and technical workshops.
- Conduct long-term studies on the health, environmental, and socio-economic impacts of nuclear incidents to inform future safety improvements.
- Develop advanced radiation detection, modeling, and risk assessment tools to strengthen early warning and response capabilities.





National Academia Input
Search & Rescue, Law Enforcement

- Provide immediate medical and psychological support to affected populations.
- Implement long-term health surveillance for radiation exposure.
- Use drones and AI for search, mapping, and damage assessment.
- Apply structured systems such as the Incident Command System (ICS) for coordinated response.
- Deploy robots in hazardous or confined high-radiation zones.
- Ensure availability of advanced rescue tools and detection equipment.
- Coordinate safe decontamination procedures for victims, responders, and equipment before hospital transfer or redeployment.
- Maintain stockpiles of personal protective equipment (PPE), radiation detectors, and medical countermeasures.

International Academia Input
Search & Rescue, Law Enforcement

- Conduct after-action reviews to improve future response capacity.
- Secure affected areas and manage evacuations effectively.
- Coordinate with national and international emergency response teams.
- Develop clear communication protocols to guide evacuations, shelter-in-place orders, and public safety instructions.
- Conduct joint exercises with military, fire services, and health authorities to strengthen inter-agency interoperability.
- Ensure responder health monitoring and psychological support programs to address occupational stress and radiation exposure risks.

National Academia Input
Local Media and Early Warning Center

- Provide transparent communication on radiation risks and safety measures.
- Broadcast nuclear emergency alerts and evacuation instructions promptly.
- Counter misinformation and rumors during crisis situations.
- Conduct public education campaigns on radiation safety and preparedness.
- Report regulatory gaps or minor incidents to encourage accountability.
- Set up real-time public inquiry helplines and digital platforms to address community concerns and reduce panic.
- Archive and document incident coverage to support transparency, lessons learned, and future preparedness planning.

International Academia Input
Local Media and Early Warning Center

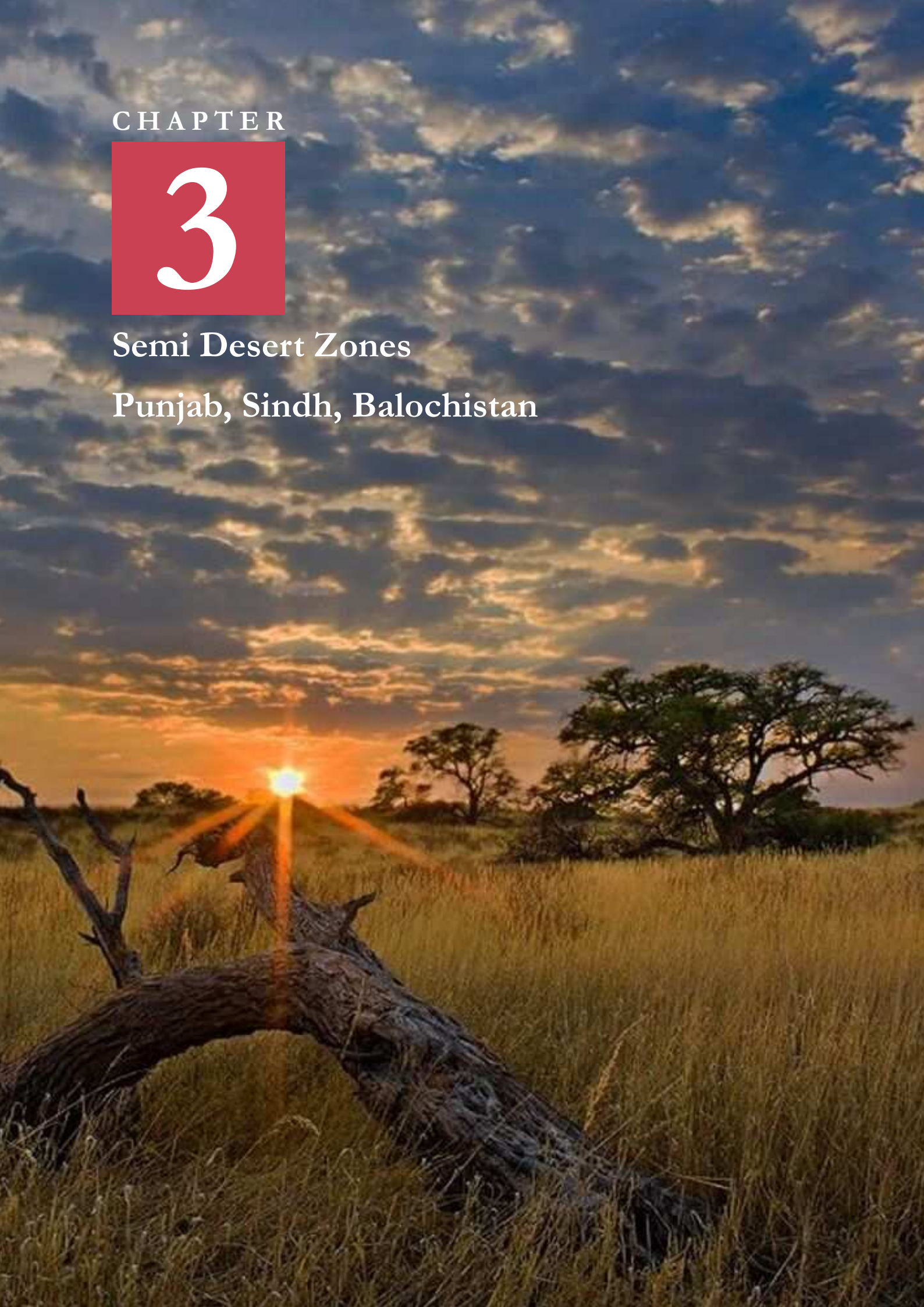
- Coordinate closely with emergency authorities for verified updates.
- Support long-term public awareness on recovery and health monitoring programs.
- Maintain multi-platform communication channels for rapid outreach.
- Train journalists and media personnel in basic radiation science and crisis communication to improve accuracy and responsible reporting.
- Develop multilingual communication strategies to reach diverse and vulnerable populations effectively.

CHAPTER

3

Semi Desert Zones

Punjab, Sindh, Balochistan



(a) Contingency – Abnormal Heat / Climate Change

National Academia Input
Individual & Community Level

- Conduct community annual orientation seminars on natural disaster awareness and management to ensure readiness and safety.
- Initiate tree planting to combat climate change on both local and global mitigation efforts.
- Adopt green roofs as a sustainable solution to reduce energy consumption, mitigate heat-related health risks.
- Ensure proper town planning rules and regulations followed for all existing and future townships.
- Establish "Cool Centers" equipped with amenities such as drinking water, fans, and air conditioning at public locations and along main avenues.

International Academia Input
Individual & Community Level

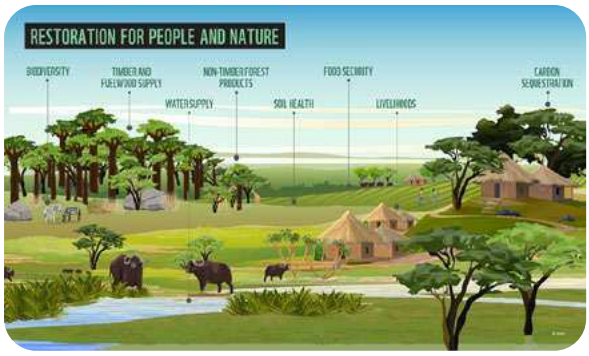
- Encourage the use of cycling as viable alternatives to private vehicles by implementing car dependency reduction measures, and advocating for cleaner fuel technologies to minimize transportation emissions.
- Communities and individuals worldwide should actively engage in tree plantation initiatives.
- Improve ventilation systems, and create additional green spaces.
- Install roofs and pavements with high albedo to reduce heat absorption within buildings.

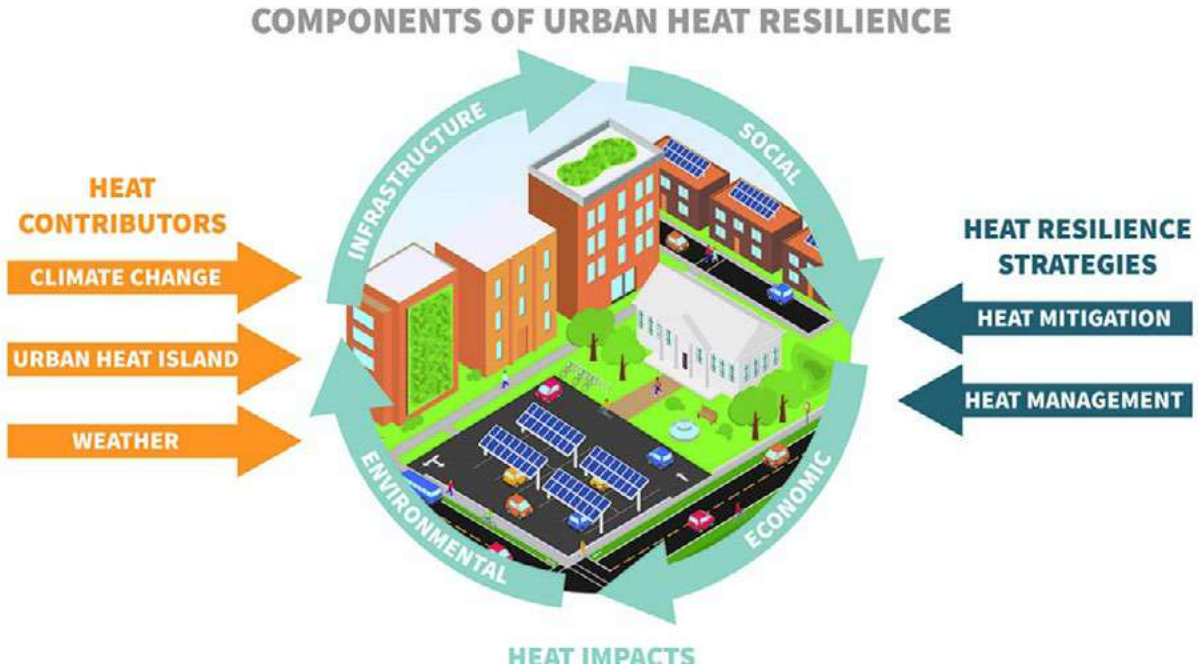
National Academia Input
Area Governance

- Implement a coherent future development strategy that prioritizes tree planting, ecosystem restoration, and the construction of environmentally friendly, well-planned residential and commercial areas and infrastructure to improve human habitats.
- Prioritize disaster preparedness and response mechanisms tailored to desert environments
- Involve active participation and empowerment of local communities in decision-making processes related to disaster risk reduction and resilience-building.

International Academia Input
Area Governance

- Develop and enforce heat action plans, building codes, and land-use policies prioritizing resilience and adaptation to heat in urban planning and disaster risk reduction strategies.
- Focus on rural development initiatives aimed at improving infrastructure, healthcare, education, and livelihood opportunities for residents.
- Prioritize adaptation strategies such as promoting drought-resistant crops, introducing climate-smart agricultural practices, and investing in renewable energy sources like solar power





National Academia Input
Role of Federal Organizations

- Disseminate advisories, and share alerts with government authorities and non-government stakeholders.
- Reform existing building and land use regulations in the city and cantonment areas to incentivize green urbanization.
- Construct residences using thick walls of natural materials like adobe or stone to enhance insulation against heat.

International Academia Input
Role of Federal Organizations

- Ensure to launch a Heat Health Action Plan (HHAP), urging all provinces to prepare for and manage impending heatwave conditions for workers across sectors, in alignment with the Ministry of Labor and Employment initiatives.
- Initiate extensive awareness campaigns on urban heatwaves, implement impact-based forecasting systems, and provide household cash assistance.

National Academia Input
Private Sector and Local Industry Role

- Prioritize resource allocation towards sustainable transportation alternatives.
- Invest in highly insulative building materials for improved energy efficiency in construction
- Businesses should evaluate and minimize their carbon footprint, while also offsetting any remaining greenhouse gas emissions.

International Academia Input
Private Sector and Local Industry Role

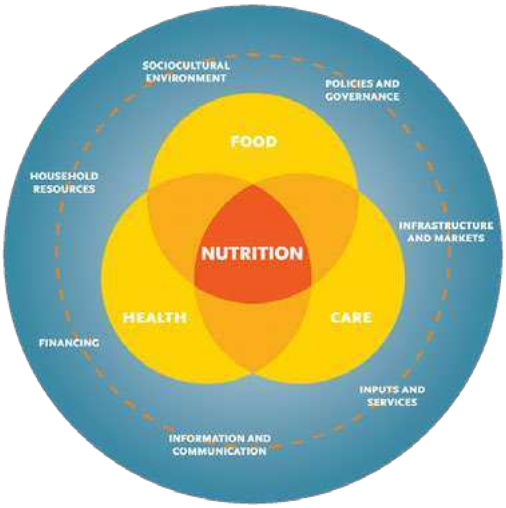
- Assess carbon footprints and implement measures to reduce it, and compensate for any remaining emissions.
- Install awnings in private residences or elderly care homes which can provide shading and temperature control, enhance comfort and energy efficiency.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Handle the medical surge by directing individuals to nearby response centers for medical assistance through partnerships with social welfare organizations.
- Collaborate with social welfare organizations to direct individuals to nearby response centers which can offer crucial assistance and support.
- Assign personnel to vulnerable locations which can bolster support and aid in safeguarding.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Advocate for governments to broaden social safety nets for effected groups, encompassing public healthcare and providing compensation for lost earnings.
- Deliver essential health services, nutritional supplements, counseling, preschool activities, and awareness programs for effected population.



National Academia Input
Area Academia, Think Tanks

- Urban planning can greatly reduce the impact of extreme heat by integrating green spaces or implementing cool roofs and pavements, which reflect sunlight instead of absorbing it
- Enhance resilience against increasing heatwaves, and devise adaptation strategies based on the spatial and temporal characteristics of heatwaves and their fluctuations.

International Academia Input
Area Academia, Think Tanks

- Provide training for healthcare professionals to recognize and manage heat-related conditions effectively, ensuring prompt and appropriate care for those affected by extreme heat.
- Choose homes made with limestone and natural materials, which absorb moisture in humid weather and release it through evaporation in hot weather, aiding in temperature regulation.

National Academia Input
Local Media and Early Warning Center

- Utilize local FM radio broadcasts to share heatstroke safety measures and precautions.
- Issue timely Hot Day Advisories and Warnings in response to hot weather alerts originating from both domestic and international sources.
- Educate the public to drink enough water, avoid prolonged sun exposure in hot weather, and refrain from vigorous activities to prevent dehydration.

International Academia Input
Local Media and Early Warning Center

- Utilize a variety of communication channels in early warning dissemination systems.
- Utilize focused outreach methods such as billboards, mobile messaging services, and media alerts to caution vulnerable groups and convey essential messages.
- Create tailored heat advice messages to effectively inform and prepare communities for managing extreme heat conditions, promoting safety and well-being.

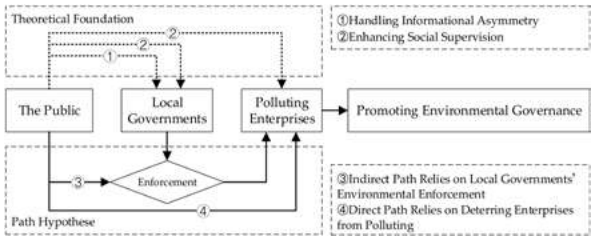
(b) Contingency – Sand & Dust Storms

National Academia Input
Individual & Community Level

- Place damp sheets in front of doorways and windows to filter out dust effectively.
- Encourage afforestation and reforestation efforts in vulnerable areas to stabilize soil and reduce erosion.
- Advocate for stronger environmental regulations and policies at the local, regional, and national levels to address land degradation, desertification, and air quality issues.
- Participate in local governance processes, community meetings, and public consultations to advocate for environmental protection measures, allocate resources for dust storm mitigation, and ensure accountability of decision-makers.

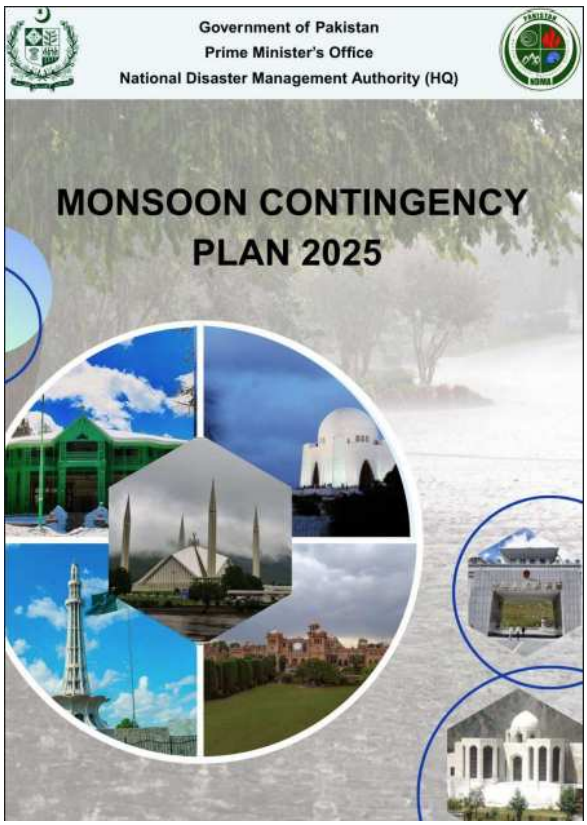
International Academia Input
Individual & Community Level

- Build green land to reduced dust storm frequency and severity.
- Foster collaboration and partnerships with local authorities, NGOs, and other stakeholders to address environmental challenges collectively and implement effective solutions.
- Take precautions to protect health during dust storms by staying indoors, using air purifiers or masks when outdoors, and seeking medical attention if experiencing respiratory issues or other health problems related to dust exposure.
- Facilitate capacity building training programs for local communities on sustainable land management practices, disaster preparedness, and response strategies to build resilience against dust storms



National Academia Input
Area Governance

- Develop Sand/dust storm contingency plans at the district level to ensure prompt emergency responses to sand storms.
- Ensure that infrastructure projects in desert regions are designed and implemented with consideration for their potential environmental impacts.
- Engage local communities in decision-making processes and empowering them to participate in the management of their natural resources fosters a sense of ownership and responsibility



International Academia Input
Area Governance

- Implement sustainable water management practices that ensure equitable access to water resources while minimizing water-related conflicts and environmental degradation in desert areas
- Provide training, technical assistance, and access to information and resources to enhance understanding of dust storm dynamics and implementation of appropriate response measures.

National Academia Input

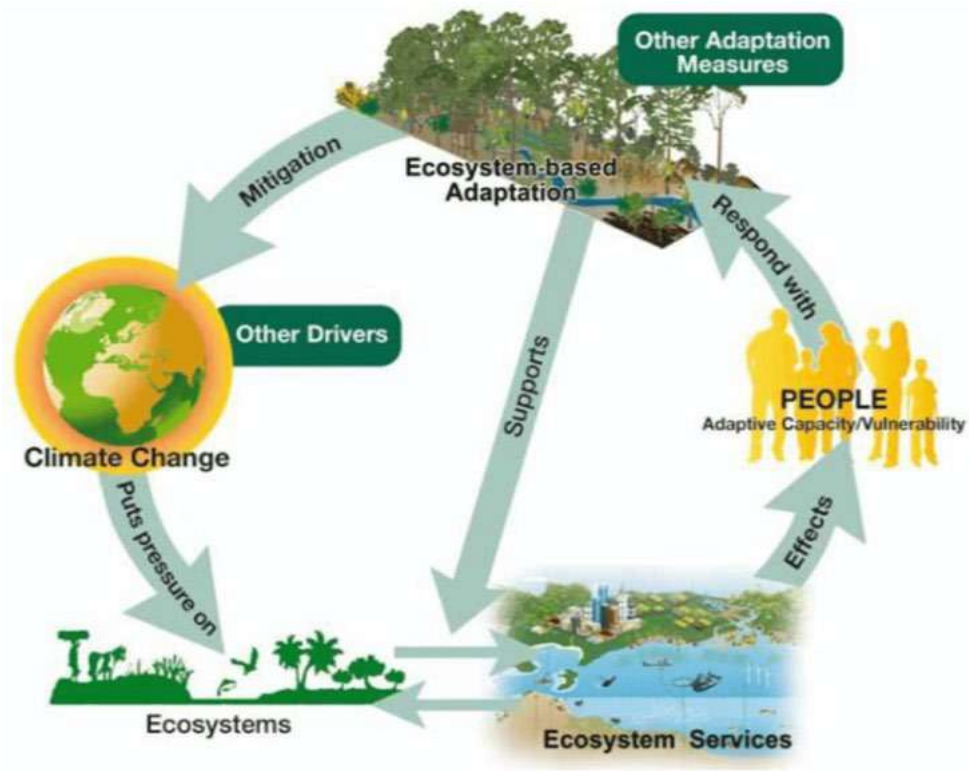
Role of Federal Organizations

- Promote increased vegetation to reduce the occurrence of dust storms, as regions with more greenery experience fewer incidents.
- Organize routine public awareness drives regarding the dangers and precautionary measures during sandstorms.
- Collaborate with neighboring countries, international organizations, and research institutions to exchange knowledge, data, and expertise on dust storm management and mitigation strategies.

International Academia Input

Role of Federal Organizations

- Foster cooperation with neighboring countries as a highly effective approach to addressing shared challenges and achieving mutual goals, enhancing regional stability and prosperity.
- Identify and designate emergency shelters in vulnerable regions to ensure preparedness for potential crises.
- Adopt ecosystem-based approaches to desert management that prioritize the conservation and restoration of natural ecosystems.



National Academia Input
Private Sector and Local Industry Role

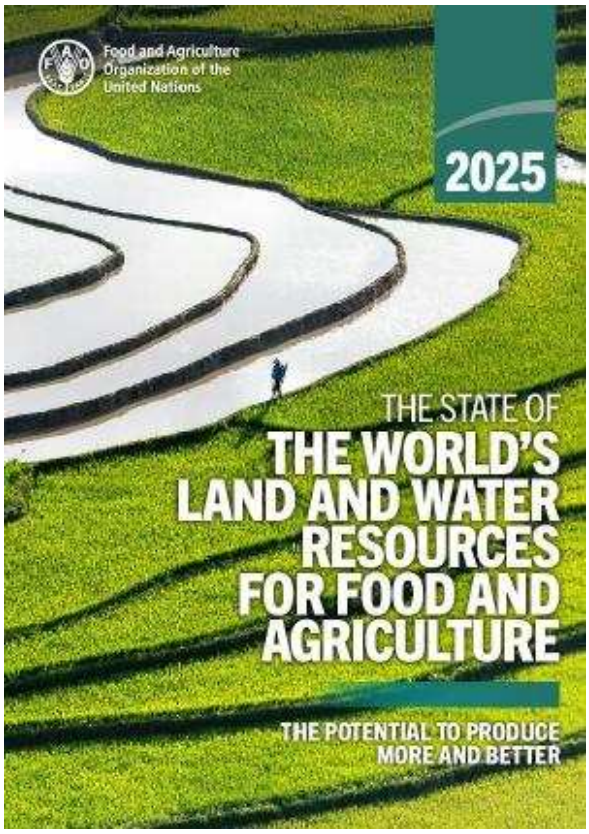
- Encourage industries and private entities to fortify buildings and critical infrastructure against sand/dust storm winds through structural reinforcement and the use of resilient materials.
- Improve preparedness and resilience to sandstorms through awareness-raising and education initiatives targeting employees, stakeholders, and local communities.

International Academia Input
Private Sector and Local Industry Role

- Private sector firms and local industries should incorporate resilient design features in infrastructure projects to withstand sandstorms, including using wind-resistant materials, installing windbreaks, and implementing drainage systems to prevent sediment buildup.
- Implement dust control measures, including the application of suppressants (like water or chemical stabilizers to unpaved roads) covering loose materials, and installing wind breaks to mitigate airborne particle spread during sandstorms and protect public health.

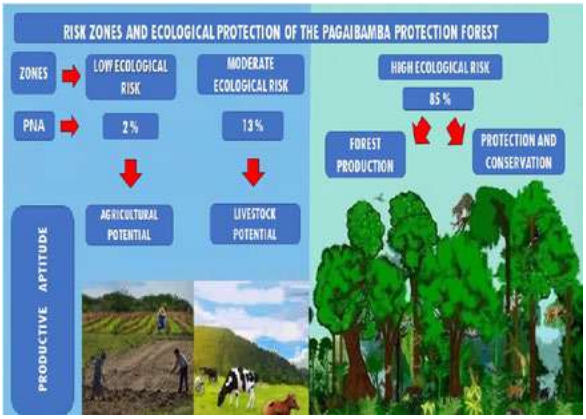
National Academia Input
NGOs, Humanitarian Resource Enablers

- Conduct educational workshops to raise awareness of sandstorm risks and provide communities with skills for mitigation, including soil conservation, vegetation maintenance, and emergency preparedness.
- Identify sensitive areas prone to dust storms, setting aside protected areas, and zoning regulations that promote sustainable land use practices.



International Academia Input
NGOs, Humanitarian Resource Enablers

- Allocate resources efficiently and promote regional cooperation.
- Monitor and evaluate the effectiveness of their interventions and projects in reducing dust storm risks and improving environmental conditions in desert areas.
- Collaborate with a wide range of stakeholders, including government agencies, research institutions, businesses, and other NGOs, to leverage resources, expertise, and networks for addressing dust storm issues comprehensively.

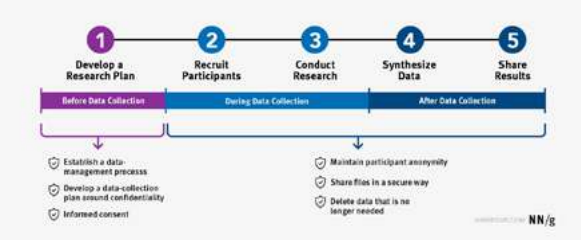


National Academia Input
Area Academia, Think Tanks

- Foster the cultivation of drought-tolerant trees and shrubs to stabilize soil, reduce erosion, and mitigate sandstorm intensity.
- Facilitate joint education sessions for biomedical and meteorological experts to enhance understanding of dust storms and their impacts.
- Researchers should collaborate with colleagues from other countries facing similar dust storm issues to share data, best practices, and lessons learned, leading to more effective global responses to dust storm challenges.

International Academia Input
Area Academia, Think Tanks

- Utilize media coverage and SMS alerts to communicate warnings about impending dust hazards, health risks, and mitigation options effectively.
- Raise public awareness about dust storm issues through educational outreach programs, public lectures, and media campaigns.
- Develop and implement policies that promote sustainable land use, climate change adaptation, and resilience-building in desert areas.

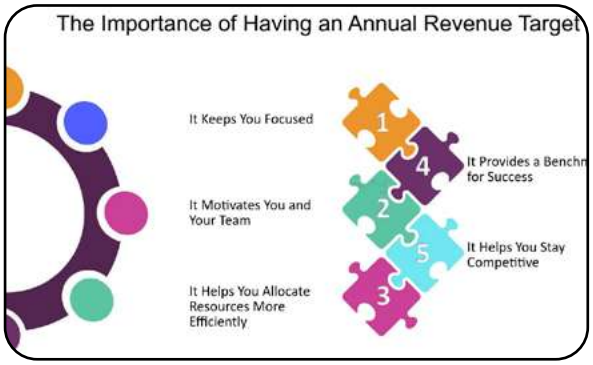


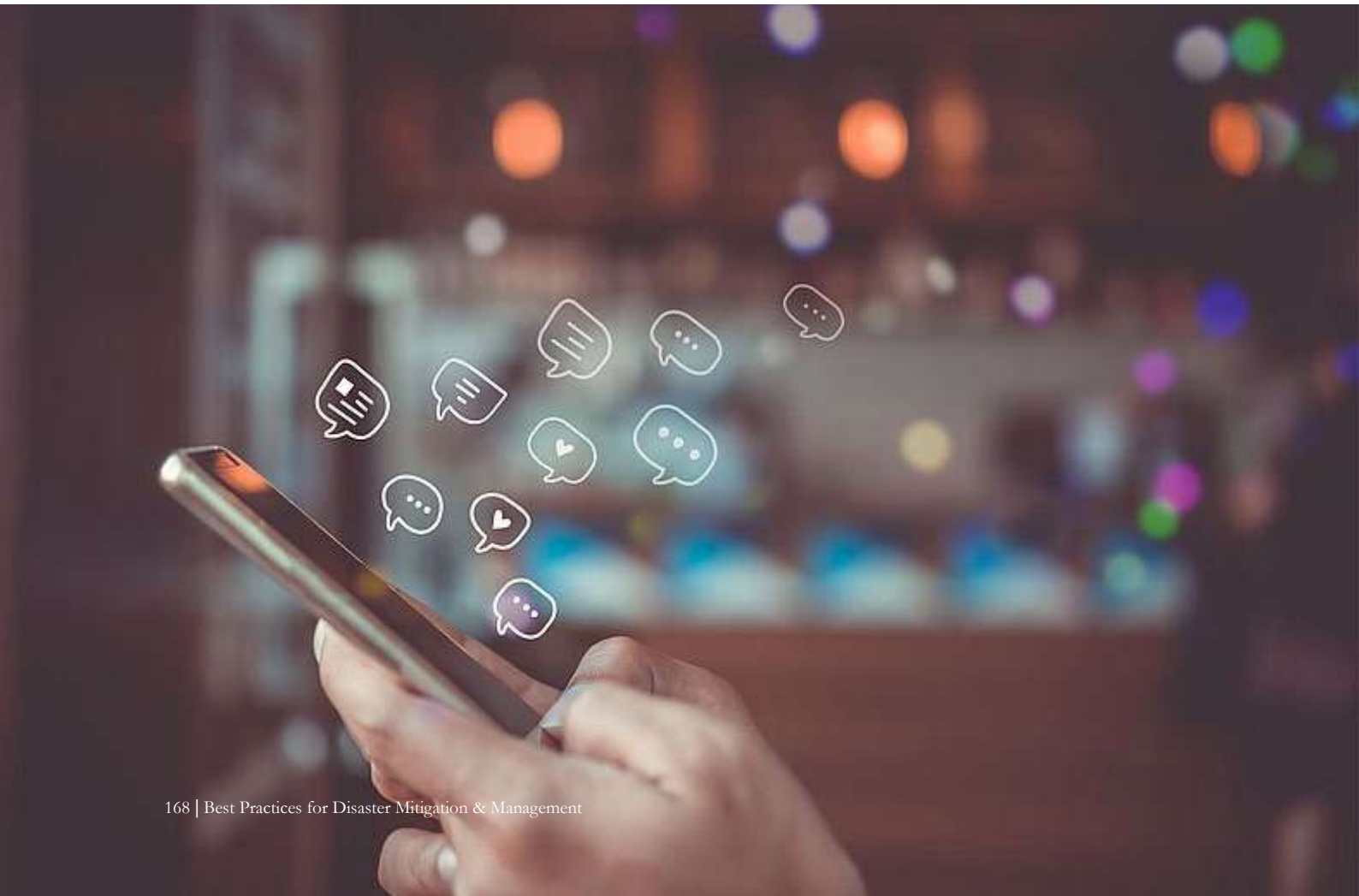
National Academia Input
Local Media and Early Warning Center

- Spread timely alerts using diverse communication channels to notify both the public and authorities.
- Issue alerts for sandstorm events through the meteorological Departments, local media, and SMS to registered users.
- Establish a robust meteorological monitoring network to track weather patterns and identify potential storm systems
- Conduct risk assessments to evaluate the potential impacts of storms on affected areas, including the likelihood of hazards such as strong winds, heavy rainfall, flooding, and lightning strikes

International Academia Input
Local Media and Early Warning Center

- Establish Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) which will enhance forecasting and expertise on sand and dust storms through international collaboration among research and operational groups, ensuring prompt and reliable forecasts and information.
- Media coverage and SMS text alerts should be use to disseminate information effectively
- Utilize advanced meteorological models and data analysis techniques to forecast the development and movement of storms.





(c) Contingency – Air Pollution

National Academia Input
Individual & Community Level

- Transition of railways propulsion and road vehicles from diesel and petrol to CNG/LNG/ electricity.
- Communities can organize clean-up drives to remove debris and litter from public spaces.
- Take steps to minimize dust generation by properly maintaining unpaved roads, using dust suppressants on driveways and construction sites, and landscaping with vegetation to stabilize soil
- Individuals can plant trees and vegetation around their homes and in public spaces to provide natural barriers against wind erosion and dust storms.

International Academia Input
Individual & Community Level

- Promote the use of cleaner cooking fuels like biogas, compressed natural gas (CNG), and liquefied petroleum gas (LPG) can help to mitigate indoor air pollution and urban heat.
- Engage communities in monitoring air quality using low-cost sensors.
- Promote the creation of green spaces in desert communities to absorb pollutants, provide shade, and improve air quality.
- Advocate for the development and enforcement of local regulations to address sources of air pollution at the community level.

National Academia Input

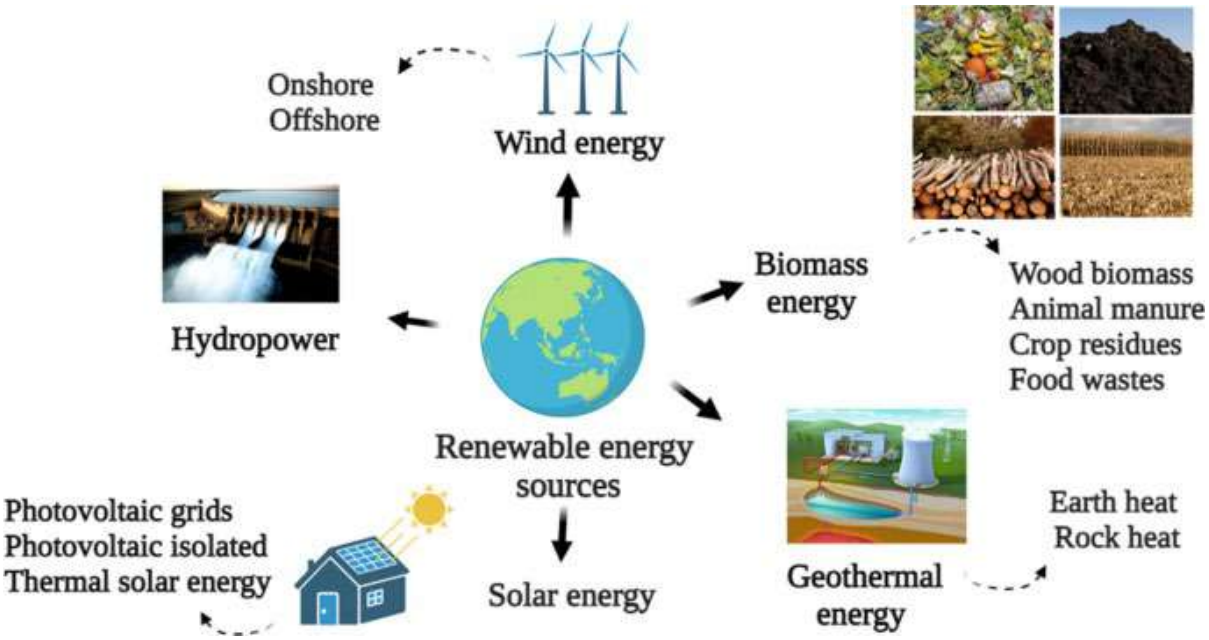
Area Governance

- Develop land use plans that prioritize sustainable land management practices in desert regions.
- Implement and enforce regulations to control sources of air pollution in desert regions.
- Incentivize the adoption of clean energy technologies such as solar and wind power in desert regions.

International Academia Input

Area Governance

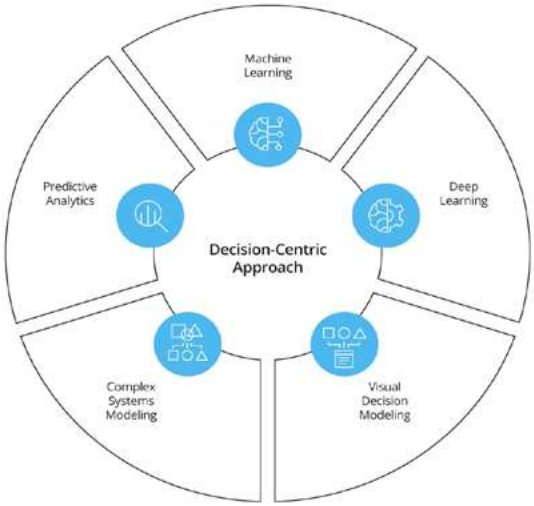
- Expand and enhance rapid bus transit networks in cities for more efficient urban transportation.
- Develop comprehensive air quality management plans that outline strategies for reducing air pollution in desert regions.
- Establish regulations to control dust emissions from construction sites, unpaved roads, and other sources contributing to air pollution in desert areas.
- Implement dust suppression techniques such as road paving, vegetative cover, and dust control agents to reduce dust emissions from unpaved roads, construction sites, and other dusty surfaces in desert areas.



National Academia Input

Role of Federal Organizations

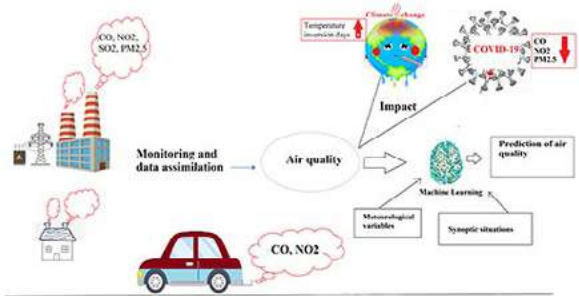
- Regulate emissions, provide forecasts and monitor pollution.
- Manage infrastructure, and devise strategies for effective pollution control.
- Use real-time data and modeling techniques to inform decision-making and prioritize mitigation efforts.
- Implement strict regulations and emission controls for industries operating in or near desert areas.

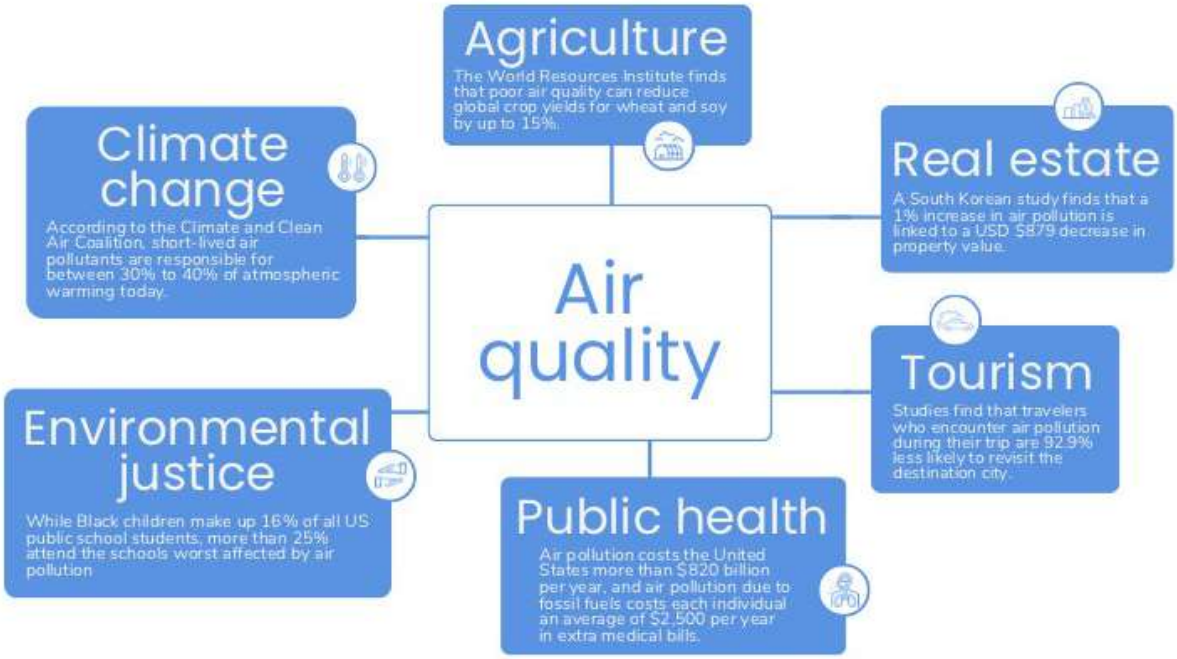


International Academia Input

Role of Federal Organizations

- Enforce emission standards and promote cleaner technologies to enhance air quality and sustainability.
- Establish comprehensive air quality monitoring networks to track pollution levels and identify hotspots of air pollution in desert regions.
- Invest in research and innovation to develop new technologies and solutions for reducing air pollution in desert areas.



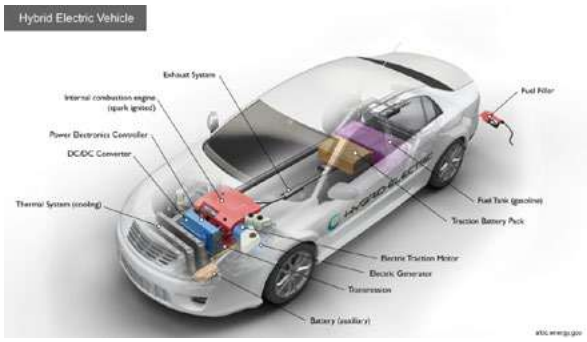


National Academia Input
Private Sector and Local Industry Role

- Promote domestic manufacturing of hybrid vehicles to combat global warming and air pollution by reducing harmful greenhouse gas emissions.
- Upgrade industrial equipment, implementing cleaner production processes, and using energy-efficient technologies to reduce air pollution from manufacturing activities.
- Implement pollution control measures such as installing air pollution control devices, dust collectors, and particulate filters in industrial facilities to capture and reduce emissions of pollutants into the air

International Academia Input
Private Sector and Local Industry Role

- Support initiatives that promote the use of clean energy sources to reduce reliance on fossil fuels and lower emissions of greenhouse gases and air pollutants.
- Promote sustainable transportation practices among local industries, such as using electric or hybrid vehicles for transportation of goods and materials.
- Implement proper waste management practices in industrial facilities to reduce emissions of air pollutants from waste incineration and disposal.
- Encourage recycling, reuse, and waste-to-energy initiatives to minimize the environmental impact of industrial waste.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Monitor air quality to engage communities, conduct research, and advocate for cleaner air standards.
- Conduct awareness campaigns and educational programs to inform local communities about the causes and impacts of air pollution in desert areas.
- Advocate for stronger environmental policies and regulations to address air pollution in desert areas.
- Provide emergency response and relief efforts.

International Academia Input
NGOs, Humanitarian Resource Enablers

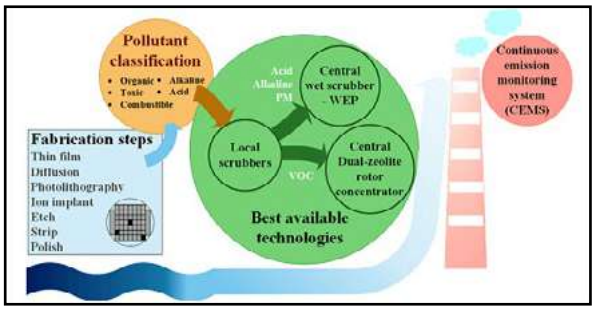
- Advocate for cleaner air, and address air pollution through campaigns and legal actions.
- Install pollution control equipment and adopt cleaner production processes to minimize emissions of pollutants into the air.
- Plant trees and native vegetation helps to prevent desertification, reduce dust emissions, and improve air quality.
- Support interdisciplinary research efforts to better understand the sources, impacts, and mitigation strategies for air pollution in arid environments.

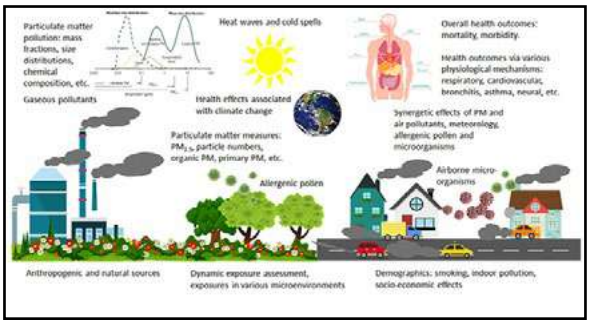
National Academia Input
Area Academia, Think Tanks

- Collaborate with research institutions, providing essential meteorological data for informed air quality decisions, showcasing academia's role in pollution control.
- Academic researchers should use advanced modeling techniques to simulate air pollutant dispersion and assess the effectiveness of different mitigation measures.
- Academic institutions should collaborate with industry partners to transfer and commercialize advance technologies, accelerating their adoption and deployment in desert regions.

International Academia Input
Area Academia, Think Tanks

- Engage with organizations to suggest air quality strategies and drive evidence-based solutions and policy advocacy for air pollution mitigation.
- Conduct long-term air quality monitoring studies to track trends in air pollution levels and assess the effectiveness of pollution control measures over time.
- Collaborate with public health agencies to assess the health burden associated with air pollution and prioritize interventions to protect public health.
- Examine the social, economic, and environmental factors that contribute to disparities in exposure to air pollution and advocate for policies that promote environmental justice and equity.



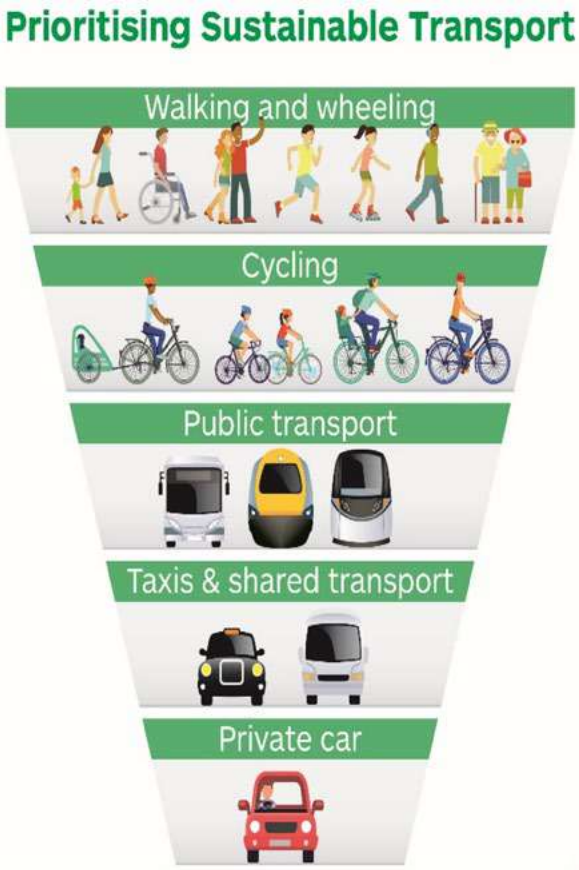


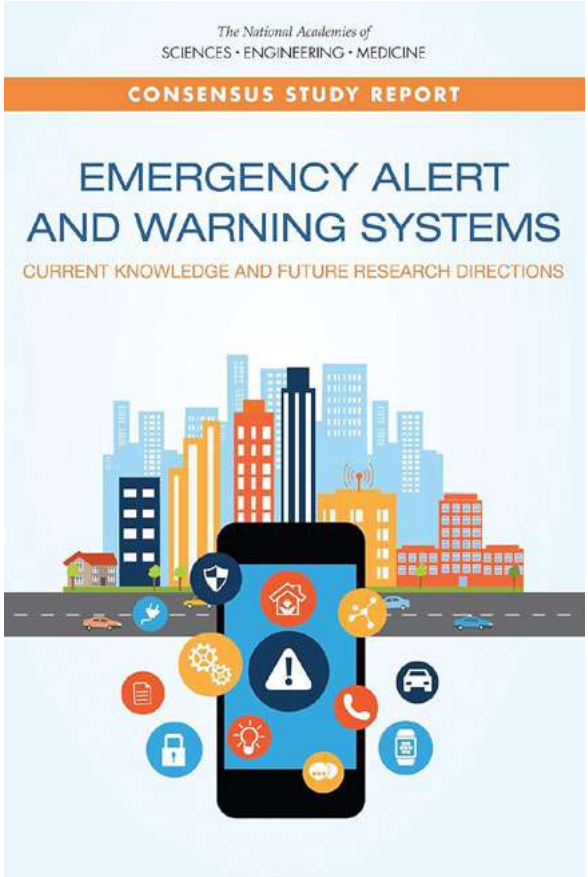
National Academia Input
Local Media and Early Warning Center

- Promote awareness about using mass transit system, and cycling for short distances to encourage sustainable transportation habits.
- Local media outlets should collaborate with environmental agencies and NGOs to run public awareness campaigns about the health risks associated with air pollution in desert regions.
- Early warning centers should organize educational workshops and outreach programs in collaboration with local media outlets to raise awareness about air pollution and its impacts on human health and the environment.

International Academia Input
Local Media and Early Warning Center

- Regularly report Air Quality Index through local media channels to inform residents.
- Implement real-time air quality monitoring systems in desert areas to continuously track pollution levels
- Establish predetermined thresholds for various pollutants based on health standards and guidelines.
- Couple early warning alerts with educational messages to inform the public about the health risks associated with air pollution and recommended actions to protect themselves.



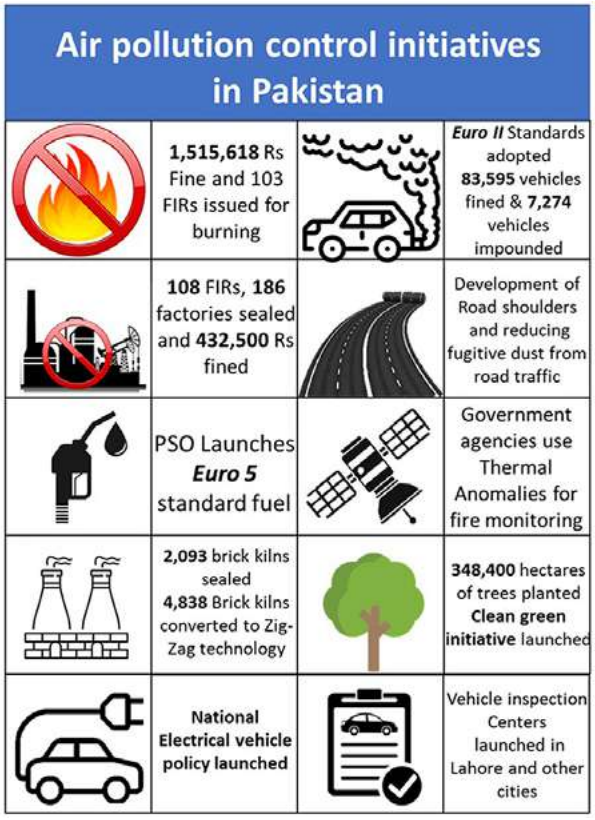


National Academia Input
Search & Rescue, Law Enforcement

- Respond swiftly to incidents, minimizing environmental impact.
- Provide first aid and medical assistance to individuals affected by air pollution-related health issues, such as respiratory problems or heatstroke.

International Academia Input
Search & Rescue, Law Enforcement

- Implement emission standards and promote public transportation to combat air pollution.
- Coordinate closely with other emergency services, such as firefighting agencies and medical responders, to ensure a coordinated and efficient response to air pollution emergencies.
- SAR teams and law enforcement agencies can engage in community outreach activities to raise awareness about air pollution hazards and promote preparedness and resilience measures.



Air pollution control initiatives in Pakistan			
	1,515,618 Rs Fine and 103 FIRs issued for burning		*Euro II* Standards adopted 83,595 vehicles fined & 7,274 vehicles impounded
	108 FIRs, 186 factories sealed and 432,500 Rs fined		Development of Road shoulders and reducing fugitive dust from road traffic
	PSO Launches *Euro 5* standard fuel		Government agencies use Thermal Anomalies for fire monitoring
	2,093 brick kilns sealed 4,838 Brick kilns converted to Zig-Zag technology		348,400 hectares of trees planted Clean green initiative launched
	National Electrical vehicle policy launched		Vehicle inspection Centers launched in Lahore and other cities

(d) Contingency – Livestock Crises

National Academia Input
Individual & Community Level

- Encourage individuals and communities to adopt water conservation practices to ensure sufficient water availability for livestock during dry periods.
- Encourage rotational grazing, pasture recovery, and fencing to control livestock movement and protect sensitive habitats.
- Explore the potential for introducing resilient cattle breeds and indigenous varieties capable of withstanding high temperatures.

International Academia Input
Individual & Community Level

- Provide livestock shelter and implement Index-based livestock insurance to safeguard against losses from injury or death.
- Improve feeding practices to indirectly enhance livestock production efficiency by adjusting diet compositions, schedules, and providing tailored training in feed production and conservation for different agro-ecological zones.
- Educate livestock owners about proper animal husbandry practices, including vaccination, deworming, and balanced nutrition, to improve livestock health and resilience to environmental stressors.

National Academia Input
Area Governance

- To address acute fodder shortages, the livestock department procures fodder from neighboring districts and arranges wheat straw or hay stacks and bundles for the animals.
- Conduct a swift evaluation of livestock damages and share the findings with relevant authorities for compensation purposes.
- Area governance bodies can formulate policies and regulations that promote sustainable livestock management practices and mitigate the impact of droughts and other environmental stressors.
- Allocate resources and funding for programs and initiatives aimed at addressing the livestock crisis, such as drought-resistant forage cultivation, water infrastructure development, and livestock insurance schemes.

International Academia Input
Area Governance

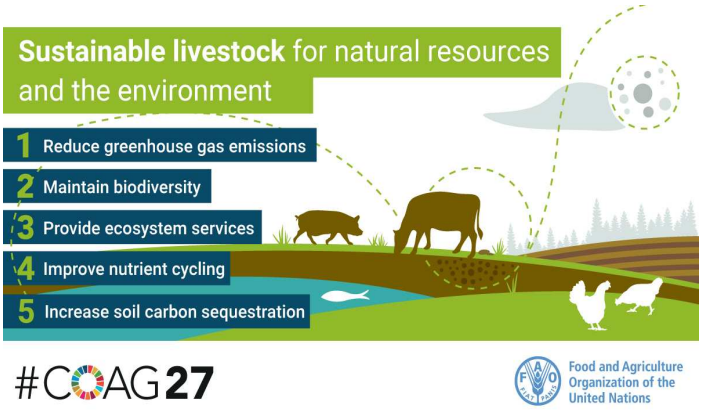
- Ensure increased availability of animal feed for farmers to meet livestock nutritional needs effectively.
- Ensure sustainable livestock development and establish national-level public-private partnerships with solid provincial and district-level foundations.
- Build the capacity of local government officials, extension workers, and community leaders to effectively implement livestock management programs and provide technical assistance to livestock owners.
- Collect data on livestock health, productivity, and resilience, as well as community well-being indicators, to assess the effectiveness of interventions and inform future actions.

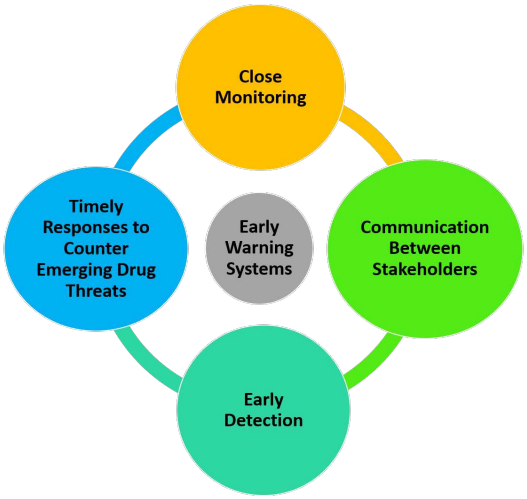
National Academia Input
Role of Federal Organizations

- Federal organizations can develop national policies and strategies for sustainable livestock management and drought resilience in desert areas
- Provide targeted facilities and subsidies to establish small ruminant feed lots for fattening and export support.
- Provide technical assistance and advisory services to provincial and local governments, NGOs, and community-based organizations involved in livestock management and drought response efforts.

International Academia Input
Role of Federal Organizations

- Invest in policy initiatives which can enhance breeding programs.
- Federal agencies can engage in policy dialogues, negotiations, and advocacy campaigns to raise awareness about the importance of addressing the livestock crisis and mobilize support for action.
- Develop and maintain early warning systems for droughts and other natural disasters that affect livestock and livelihoods in desert regions.
- Federal agencies should collect data on livestock populations, disease outbreaks, and environmental conditions to inform policy decisions and response efforts.





National Academia Input
Private Sector and Local Industry Role

- Establish national-level public-private partnerships with strong provincial and district foundations to ensure livestock development and sustainability under all conditions.
- Provide essential veterinary services, vaccines, and medications to improve the health and resilience of livestock in desert regions
- Establish fodder banks, seed production facilities, and value-added processing units to enhance fodder availability and quality.

International Academia Input
Private Sector and Local Industry Role

- Implement selective breeding programs in the private sector to develop animal varieties adapted to semi-arid conditions, including heat-resistant sheep breeds and drought-tolerant cow breeds.
- Private insurance companies should offer livestock insurance products to protect livestock owners against losses due to droughts, diseases, or other emergencies.
- Engage with local communities and stakeholders to understand their needs and priorities related to livestock management and livelihoods in desert areas

National Academia Input
NGOs, Humanitarian Resource Enablers

- Collaborate with government agencies, NGOs, and international organizations to launch projects aimed at promoting livestock farming to empower smallholders and enhance resilience in Pakistan.
- Collaborate with academic institutions and government agencies to address knowledge gaps and promote innovation in livestock production systems.

International Academia Input
NGOs, Humanitarian Resource Enablers

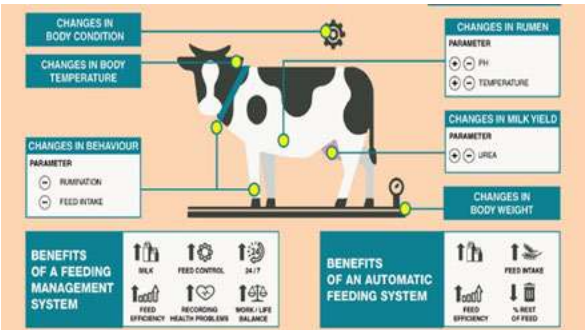
- Conduct research aimed at improving livestock productivity, resilience, and sustainability in dryland areas.
- Livestock insurance schemes should be adopted to provide financial support to affected farmers and incentivize investments in livestock management and risk reduction measures.

National Academia Input
Area Academia, Think Tanks

- Adopt low-cost and indigenous methods including improved veterinary services, strengthened informal social support systems, and small-scale local infrastructure initiatives.
- Foster educational, economic, and institutional assistance to enhance resilience and adaptability.
- Conduct research to understand the link between livestock heat stress and discomfort, hostility, and malaise for effective mitigation strategies.
- Establish long-term monitoring systems and adaptive management frameworks to track changes in livestock populations.

International Academia Input
Area Academia, Think Tanks

- Modifying mixed crop-livestock systems which can enhance food security by increasing efficiency and production, utilizing less land and water.
- Prioritize resilient animals and local knowledge for disease resilience. Avoid reliance on subsidized feed supplements and consider broader adoption of camels as an alternative to ruminants.
- Collaborate with livestock research institutions and breeding centers to develop climate-resilient livestock breeds adapted to the harsh environmental conditions of desert areas.
- Integrate gender considerations into livestock development programs and interventions to ensure the inclusion and empowerment of women in desert communities.



National Academia Input
Local Media and Early Warning Center

- Establish a network for livestock surveillance to monitor disease outbreaks and health indicators among livestock herds, allowing for prompt management and intervention.
- Early warning centers should provide timely alerts and advisories to local media outlets regarding impending droughts, extreme weather events, and other emergencies affecting livestock and livelihoods in desert areas.
- Conduct interactive TV and radio programs, town hall meetings, and community forums where experts can share insights, answer questions, and address concerns raised by community members.

International Academia Input
Local Media and Early Warning Center

- Implement a reliable early warning system like Kenya's Predictive Livestock Early Warning System (PLEWS), to mitigate livestock losses.
- Develop interactive data visualization tools and dashboards that display relevant information on climate trends, drought forecasts, and livestock indicators for decision-makers, researchers, and the public.
- Explore the use of drone technology in collaboration with early warning centers to monitor livestock populations in remote desert areas.

National Academia Input
Search & Rescue, Law Enforcement

- Collaborate with the transport department and district administration for rescue operations, especially those involving large animals like cattle and buffaloes.
- Provide security and protection for livestock and livestock-related assets during emergencies, such as theft, looting, or vandalism.

International Academia Input
Search & Rescue, Law Enforcement

- Collaborate with veterinary professionals to set up temporary rescue camps in affected areas, providing care for sick, injured, and dying animals.
- Establish control centers to coordinate veterinary assistance and manage supplies, ensuring access to painkillers, antibiotics, and fracture equipment.
- Establish emergency shelters and distribution centers for livestock feed, water, and veterinary supplies during droughts or other emergencies.

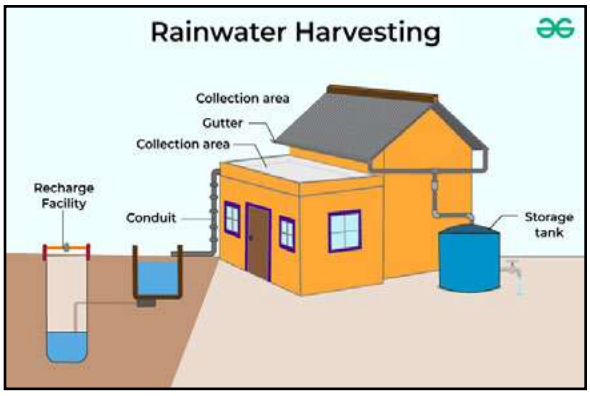
(e) Contingency – Drought, Water Scarcity

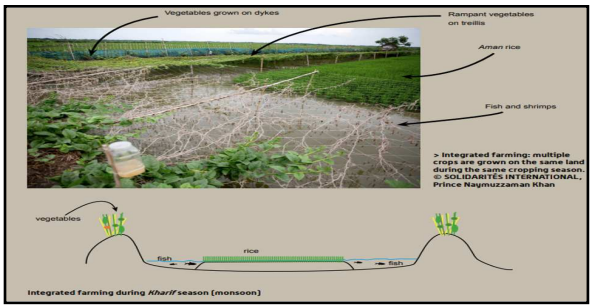
National Academia Input
Individual & Community Level

- Adopt indigenous water management practices include Tobas, Kunds, Wells, and Tubewells, these are the various methods for collecting, storing, and utilizing water resources.
- Enhanced water management practices include rainwater harvesting through ponds, micro-catchments, and rooftop systems.
- Communities should actively participate in recharging aquifers and managing both surface water and groundwater resources through conjunctive use.

International Academia Input
Individual & Community Level

- Teach individuals to modify or enhance their behavior could be pivotal in significantly diminishing future water crisis.
- Promote sustainable agriculture practices like Hydroponics and Aeroponics for soil-free plant cultivation using water-based nutrient solutions or mist environments.
- Encourage the adoption of Agri-voltaic by combining agricultural practices with solar panel installations



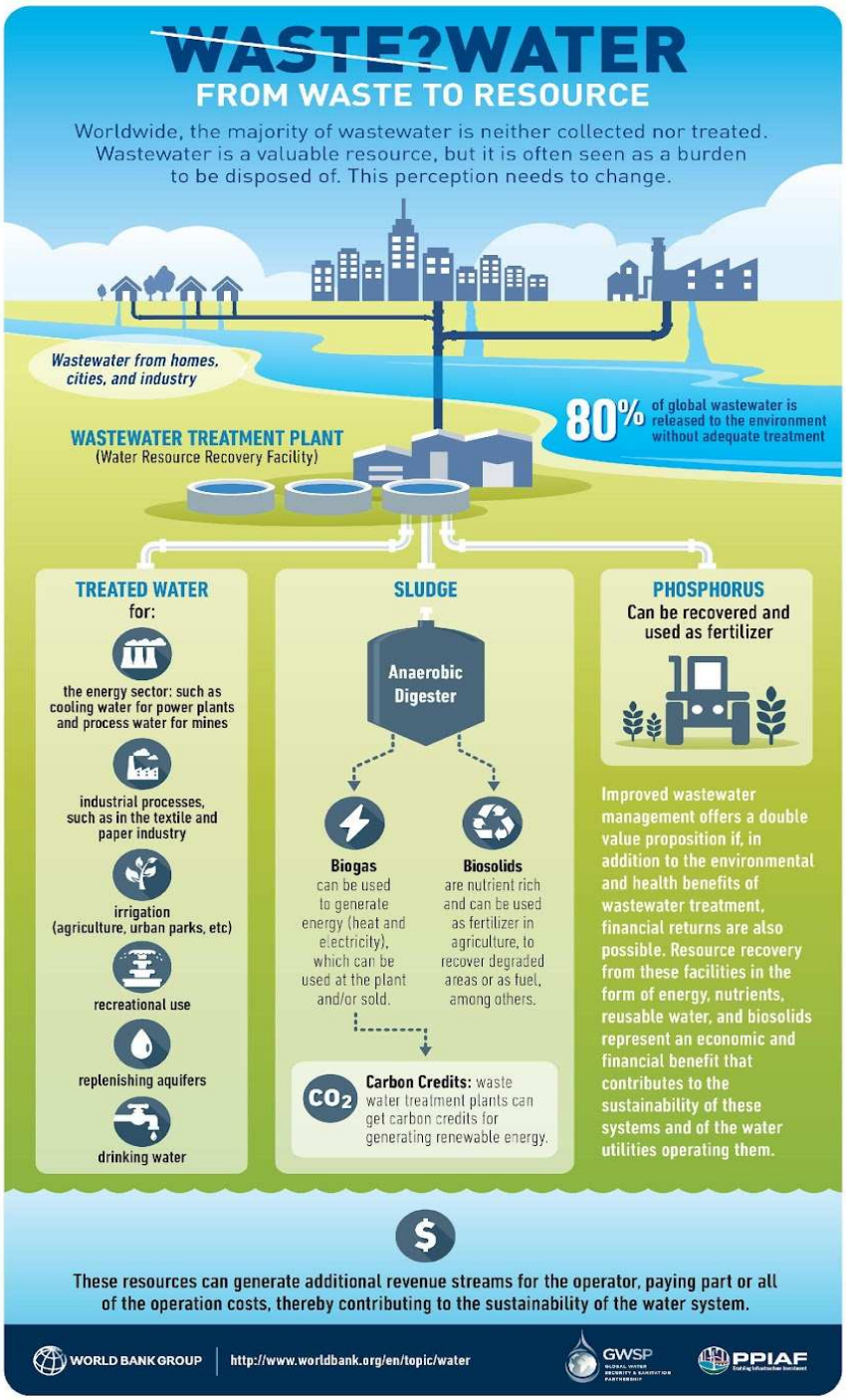


National Academia Input
Area Governance

- Implement treated wastewater reuse and seawater desalination to address water scarcity challenges.
- Implement water supply and demand management strategies and promoting the adoption of efficient irrigation systems in agriculture.

International Academia Input
Area Governance

- Emphasize rainwater recycling and wetland integration into urban areas, to address water scarcity and promote groundwater replenishment in Pakistan.
- Adopt Non-conventional water resources management techniques to save water including water harvesting, treated wastewater and water saving irrigation techniques.



National Academia Input
Role of Federal Organizations

- Improve water management by constructing ponds, enhancing irrigation efficiency with channels, dripping pipes, and sprinklers, and implementing climate-resilient water harvesting methods.
- Establish guidelines for water allocation, irrigation efficiency, groundwater management, and drought preparedness to ensure sustainable water use and equitable access across regions.
- Develop water management plans, allocate water resources for various uses, and monitor water availability and quality to address issues of scarcity, contamination, and depletion.

International Academia Input
Role of Federal Organizations

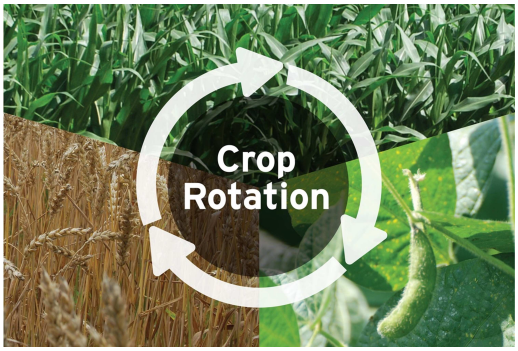
- Invest in the development of water infrastructure, such as dams, canals, irrigation networks, and water treatment plants, to improve water supply reliability and distribution efficiency.
- Coordinate drought relief and assistance programs to support affected communities, livestock owners, and farmers during periods of water scarcity and food insecurity.
- Advocate for policies, strategies, and investments that prioritize water security, drought resilience, and sustainable development.

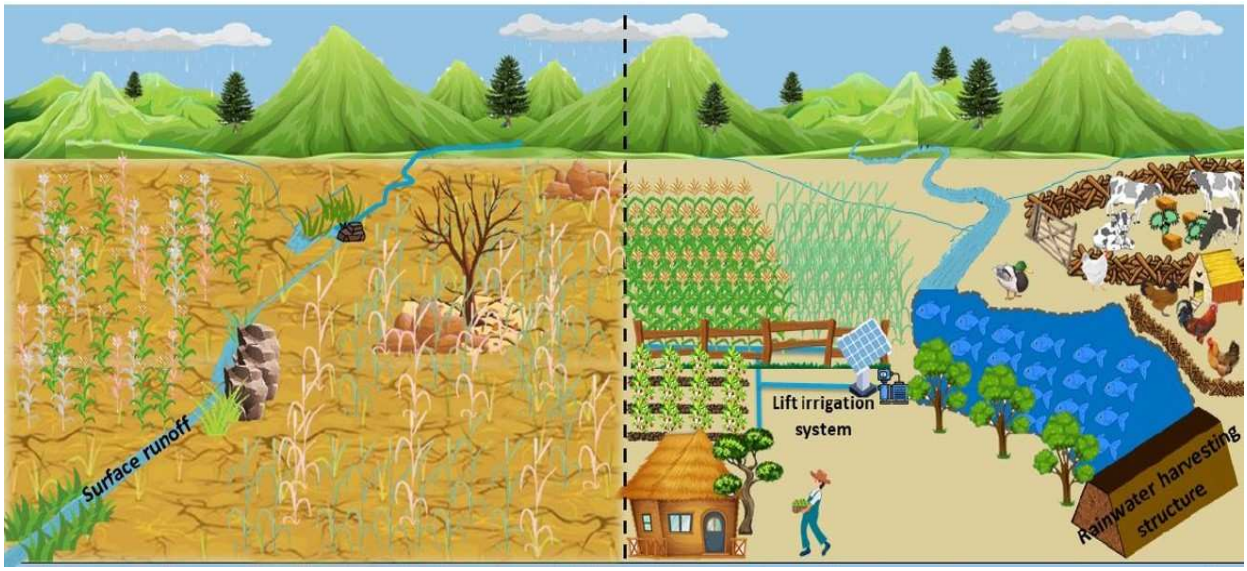
National Academia Input
Private Sector and Local Industry Role

- Establish Drought Monitoring and Forecasting Systems (DMFS)in drought prone areas.
- Invest in the development of water infrastructure such as desalination plants, water treatment facilities, and water distribution networks.
- Develop and implement innovative water conservation technologies and practices for industrial processes, agriculture, and urban water management.

International Academia Input
Private Sector and Local Industry Role

- Implement a smart-water management system which enhances the dependability and integrity of water management practices, addressing water scarcity effectively.
- Encourage local industries, particularly agribusinesses, to adopt water-efficient agricultural practices and technologies that reduce water usage while maintaining productivity.
- Private companies should implement Corporate Social Responsibility (CSR) initiatives focused on water conservation, community water supply projects, and drought resilience in collaboration with local communities and stakeholders.





National Academia Input
NGOs, Humanitarian Resource Enablers

- Build water ponds with engineering buildings to store water for drinking and other household uses.
- NGOs should make provision of food and water under drought conditions.

International Academia Input
NGOs, Humanitarian Resource Enablers

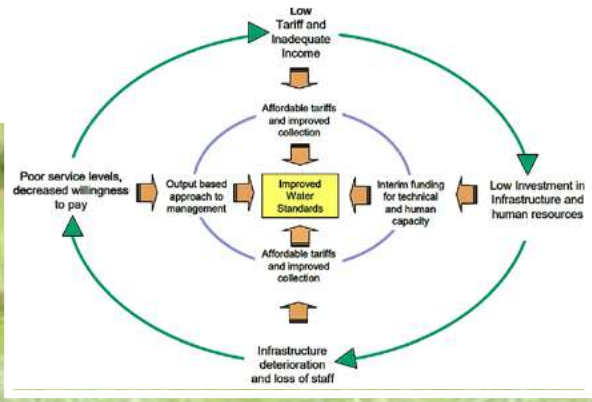
- Humanitarian organization should underscore the effectiveness of water trucking in providing clean water during infrastructure upgrades, droughts, or displacement.
- Install pumps in refugee camps can greatly enhance access to clean water for those in need.
- Supports water stewardship through initiatives, promoting sustainable water use and offering solutions to combat water scarcity.

National Academia Input
Area Academia, Think Tanks

- Ensure effective water supply via irrigation channels to address water shortages.
- Facilitate technology transfer and capacity building initiatives to empower local industries and businesses with knowledge and skills for sustainable water management.
- Encourage the adoption of water pricing mechanisms and market-based approaches that incentivize efficient water use and conservation.

International Academia Input
Area Academia, Think Tanks

- Promote public awareness campaigns, using smart meters, personalized notifications, and public dashboards to address water demand effectively.
- Consider adopting a two-tier tariff system for water users and means-tested subsidies.
- Promote water conservation and equity potentially leading to reduced overall water use.



National Academia Input
Local Media and Early Warning Center

- Implement a Drought Early Warning System (EWS) at provincial or district levels to promptly identify and forecast potential droughts.
- Monitor the precipitation, evapotranspiration, temperature, soil moisture, groundwater levels, stream flow, reservoirs and lakes to forecast drought conditions.
- Ensuring the availability of internet access across districts susceptible to drought.

International Academia Input
Local Media and Early Warning Center

- Establish automated weather data networks for quick access to climatic data, aiding in tracking drought situations effectively.
- Use Automated weather stations, soil moisture sensors, and satellite data coupled with AI techniques to forecast drought.
- Satellite data proves valuable in identifying regions where moisture deficits impact vegetation growth.

National Academia Input
Search & Rescue, Law Enforcement

- Ensure efficient ambulance services for timely transportation of drought-affected patients from remote villages to urban hospitals within the district or province.
- Ensure public safety and security in drought-affected areas by deploying law enforcement personnel to prevent water-related conflicts, disputes, and social unrest.
- Establish joint task forces, incident command systems, and mutual assistance networks to facilitate seamless communication and cooperation in emergency response operations.

International Academia Input
Search & Rescue, Law Enforcement

- Create drought preparedness and relief programs, inclusive of self-help initiatives, for regions prone to drought.
- Design programs to address the needs of environmental refugees.
- Establish joint command centers, communication channels, and response protocols to ensure a swift and coordinated response to emergencies such as water shortages, crop failures, and food insecurity.
- Enforce water use regulations, restrictions, and permits to prevent illegal water abstraction, groundwater depletion, and wasteful water practices during droughts.

(f) Contingency – Epidemics, Vector Borne Diseases

National Academia Input
Individual & Community Level

- Adopt key interventions like Insecticides-Treated Nets (ITNs), Indoor Residual Spraying (IRS), Larval Source Management (LSM), and Fogging operations for vector control, preventing disease spread, and reducing health and economic impacts.
- Establish district health committees with empowered community engagement and conduct community-friendly awareness campaigns to ensure greater accountability to affected communities.

International Academia Input
Individual & Community Level

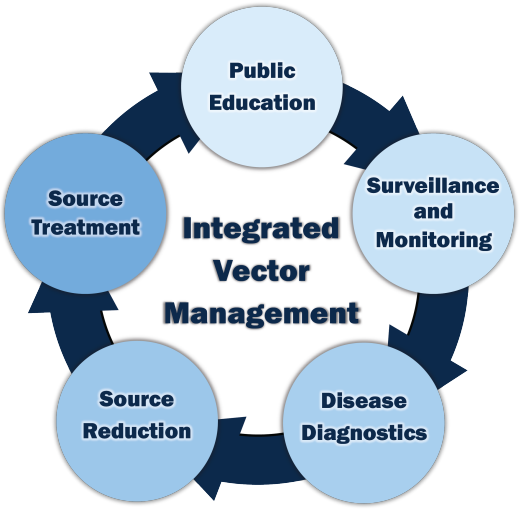
- Incorporate biocontrol agents like parasites, entomopathogens, predators, and parasitoids into breeding areas for effective vector management.
- Engage local communities through forums, educational campaigns, and health literacy initiatives to enhance understanding of epidemics, transmission pathways, preventive measures, and early symptom reporting significance.

National Academia Input
Area Governance

- District and provincial governments should ensure 100% vaccination coverage among target groups.
- District Administrations must guarantee regular cleaning and maintenance of water supply lines.

International Academia Input
Area Governance

- Embrace the Integrated Approach for Sustainable Management of Vector-Borne Diseases (VBDs) to develop a comprehensive strategy integrating various interventions with other disease control measures in Pakistan.
- Ensure regular disinfection of public spaces including hospitals, labs, dispensaries, public transport, and stations.



National Academia Input
Role of Federal Organizations

- Conduct Malaria Control Programs (MCPs) with structured vector control components at national and provincial levels in Pakistan.
- The Directorate of Malaria Control (DoMC) in Pakistan should actively manage the vector-borne diseases (VBDs) through the formulation of national policies, strategies, guidelines, and surveillance tools.

International Academia Input
Role of Federal Organizations

- Enhance regional monitoring networks, share epidemiological data, and coordinate response efforts for transboundary epidemics affecting semi-desert zones in collaboration with neighboring countries and international organizations.
- Coordination across ministries of sectors, including healthcare, agriculture, academia, and transportation, trade, and industry to implement integrated epidemic response plans and to ensure disinfection through UV radiations and sanitizing sprays.

National Academia Input
Private Sector and Local Industry Role

- Need for adaptable funding mechanisms to support malaria and VBDs response efforts across various technical actors engaged in humanitarian emergencies, including local non-governmental organizations and private sector entities.

International Academia Input
Private Sector and Local Industry Role

- Consider adopting multidisciplinary training approaches for health professionals.

National Academia Input
NGOs, Humanitarian Resource Enablers

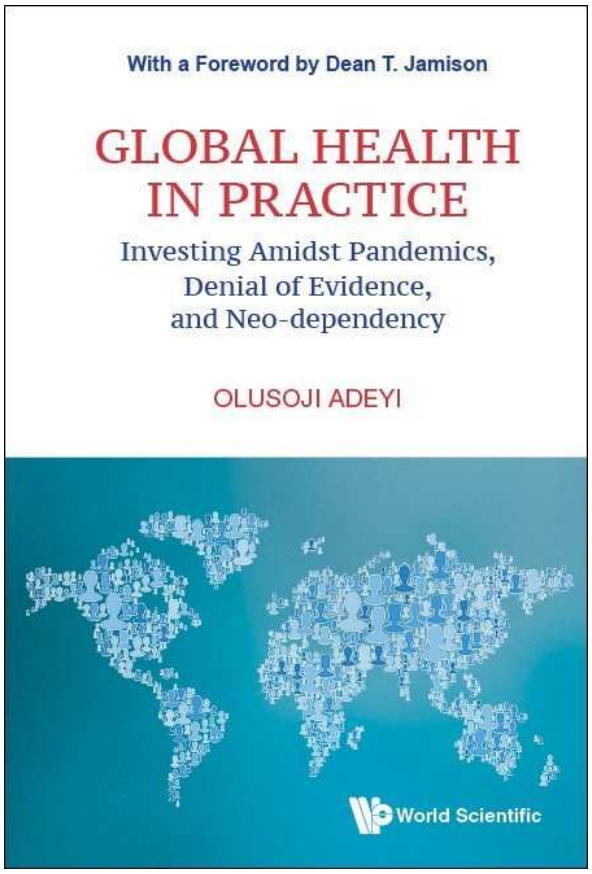
- Collaborate with NGOs and Humanitarian enablers for emergency relief efforts in Pakistan.
- Develop adaptable funding mechanisms to bolster efforts addressing malaria and vector-borne diseases during humanitarian crises, involving participation from local NGOs and private sector entities.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Assist in building and enhancing healthcare infrastructure, such as clinics, laboratories, and treatment centers, to enhance healthcare accessibility for communities residing in semi-arid regions.
- Collaborate with local health authorities to establish robust disease surveillance systems, facilitating early detection and response to epidemics and vector-borne diseases through data analysis and information exchange.

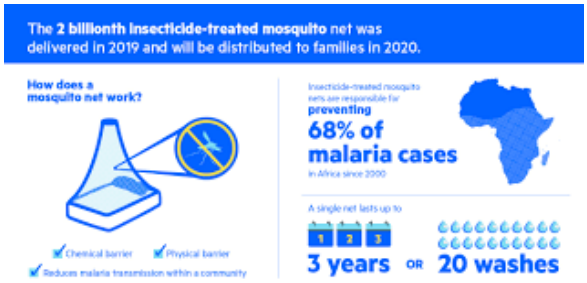
National Academia Input
Area Academia, Think Tanks

- Close collaboration among medical doctors, veterinarians, and public health officials is vital for developing predictive disease models, enabling efficient resource allocation in control programs.
- Monitor disease outbreaks, collect epidemiological data, and analyze trends to identify high-risk areas, vulnerable populations, and emerging infectious threats.
- Equip frontline responders with the knowledge, skills, and resources needed to detect, report, and respond to epidemic diseases effectively.



International Academia Input
Area Academia, Think Tanks

- Utilize modern technology to improve vector intervention monitoring, such as mobile applications for tracking the distribution of Insecticide-Treated Nets (ITNs), enhancing efficiency, and reducing direct personnel contact.
- Disseminate information through community outreach activities, educational materials, and media platforms to promote hygiene practices, vaccination uptake, and early detection of symptoms.
- Advocate for evidence-based policies, regulations, and interventions to strengthen epidemic preparedness and response in desert areas.



National Academia Input
Local Media and Early Warning Center

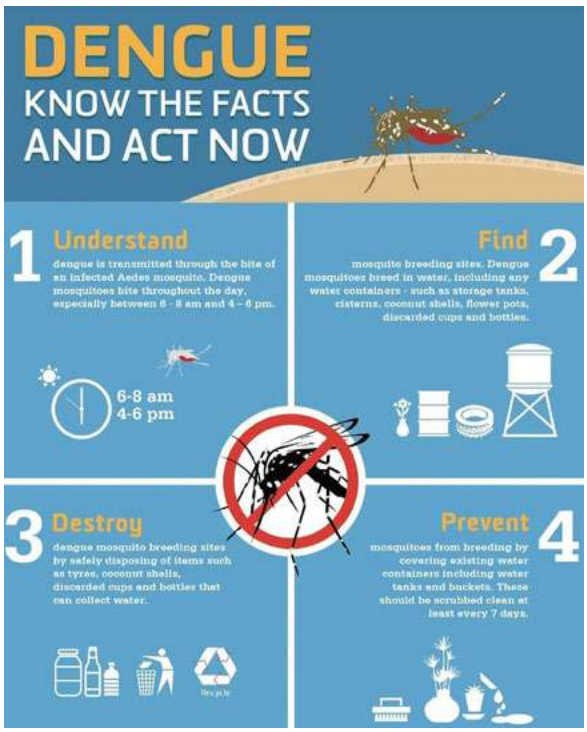
- Create platforms to inform the public about the disease and ways to prevent its spread.
- Create groups of skilled master trainers to tackle crises and epidemics.
- Local media should produce informative content, interviews with healthcare experts, and feature stories on disease prevention and control strategies to educate and empower communities
- Organize community engagement programs in collaboration with local media outlets and early warning centers to promote community participation in disease surveillance and response efforts.

International Academia Input
Local Media and Early Warning Center

- Utilize Early Warning Systems (EWS) to guide the development of effective vector control programs, including analyzing pathogen spread, monitoring spatial distribution, forecasting infections, and disseminating warnings for prompt response.
- Establish of quarantine and medical facilities supervised by trained medical care givers and doctors.
- Translate key messages, public service announcements, and educational materials into regional languages to reach diverse audiences and improve understanding of health-related messages.

National Academia Input
Search & Rescue, Law Enforcement

- The involvement of leaders, volunteers, and community-based organizations (CBOs) facilitated improved ownership and sustainability of all dengue prevention activities.
- Establish of Hospital-Based sentinel sites.



International Academia Input
Search & Rescue, Law Enforcement

- Adopt precautionary measures like social distancing, patient isolation, and quarantine.
- Treatment with antiviral and antibiotic medications and implementation of infection control measures.
- Monitor movement patterns, conduct health screenings, and enforce travel restrictions to contain outbreaks and protect public health.
- Implement water, sanitation, and hygiene (WASH) interventions to improve access to clean water, sanitation facilities, and hygiene practices in desert communities.

(g) Contingency – Food Security & Social Crises

National Academia Input
Individual & Community Level

- Cultivate salt-tolerant crops on barren lands, growing medicinal plants like Jojoba in semi-desert areas, and implementing saline forestry and small-scale horticulture using harvested rainwater for crops like pomegranates and olives.
- Local donkeys can be revitalized as they provide power and thrive on minimal vegetation.
- Focusing on home garden and village plant nurseries that can augment food security.

International Academia Input
Individual & Community Level

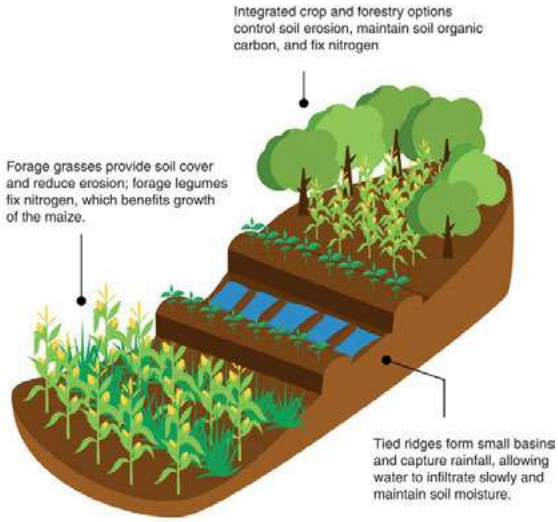
- Food security should be maintained through improved agriculture techniques, resilient chickpea varieties, Bahiagrass intercropping, and agrosilvopastoral systems for sustainable water management.
- Farmers should choose climate-adapted breeds and resilient crop varieties. Consider planting crops benefiting from climate change conditions.
- Utilize pest- and disease-resistant strains, heat- and drought-resistant breeds, and shade-grown crops.
- Practice efficient fertilizer use, soil conservation, crop association, rotation, and zero grazing.

National Academia Input
Area Governance

- Promote sustainable agriculture, improve water management, and enhance access to nutritious food for vulnerable populations
- Establish camel farming and processing facilities to export camel dairy products.
- Pakistan needs multi-sectoral interventions to address food insecurity in rural and urban areas which includes improving production, processing, transportation, storage, and marketing.

International Academia Input
Area Governance

- Encourage farmers to cultivate drought-tolerant crops, implement water-efficient irrigation techniques, and adopt agroforestry and soil conservation measures to enhance agricultural resilience to climate variability and water scarcity.
- Diversify food systems through integrated production, diverse genetic resources, and varied diets is essential for risk reduction.
- Establish market infrastructure, cold storage facilities, and market information systems to enable farmers to sell their products at fair prices and reduce post-harvest losses, thereby improving food security and livelihoods.

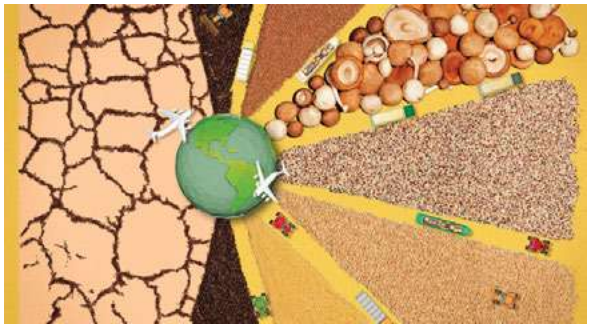


National Academia Input
Role of Federal Organizations

- Encourage water-saving agricultural practices and rotate cropping pattern in each season.
- Boost drought-affected farmers' financial stability by providing cash initiatives programs.
- Conduct research and development activities to identify innovative solutions and best practices for addressing food insecurity in desert areas.
- Federal organizations are responsible for emergency response and disaster management during food crises and natural disasters in desert regions.

International Academia Input
Role of Federal Organizations

- Advocate for policies and measures that promote food security and address underlying causes of hunger in desert regions.
- Engage in international cooperation and seek assistance from multilateral organizations, donor agencies, and development partners to address food insecurity in desert areas.

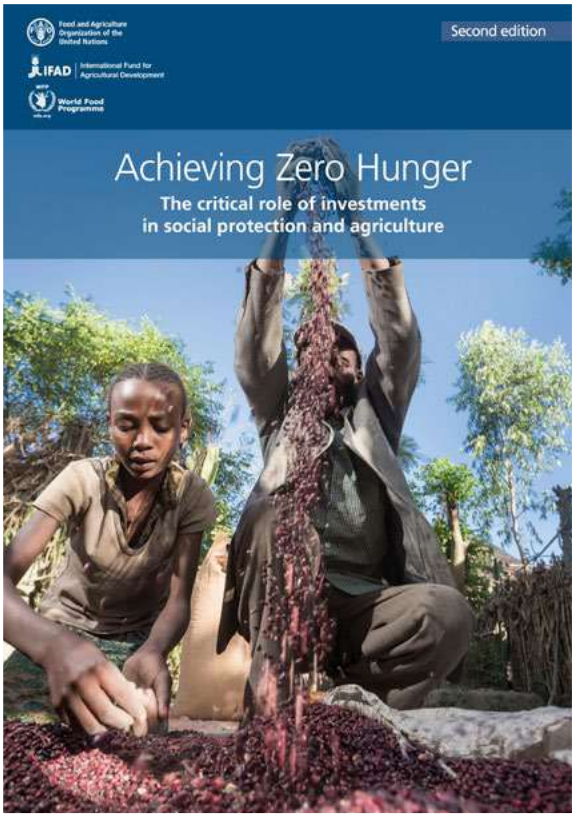


National Academia Input
Private Sector and Local Industry Role

- Initiate development and non-profit projects empowering rural communities through capacity building and by establishing small medium home-based industries.
- Private sector companies can invest in agricultural infrastructure such as irrigation systems, greenhouses, and cold storage facilities to improve productivity and reduce post-harvest losses in desert regions
- Encourage the private sector to develop and adopt innovative technologies and practices that increase agricultural productivity and efficiency in desert areas.

International Academia Input
Private Sector and Local Industry Role

- Combine public investment in social protection with increased investment from both public and private sectors in rural areas and agriculture can ensure food security.
- Support smallholder farmers through contract farming arrangements, provide access to markets, and invest in agro-processing facilities to add value to agricultural products and improve market access.
- Provide training and capacity-building programs for farmers, agribusinesses, and local communities in desert regions

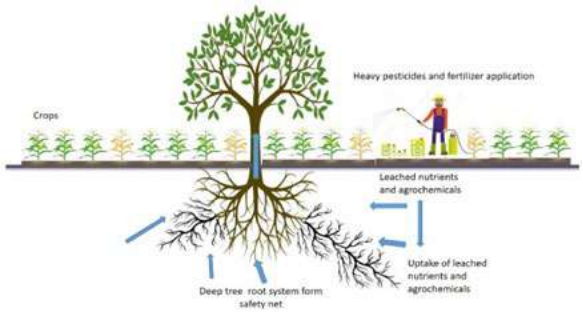


National Academia Input
NGOs, Humanitarian Resource Enablers

- Support smallholders and integrated pest and disease control, enhancing agricultural sustainability.
- Support the adoption of sustainable farming techniques, agroforestry systems, and soil conservation measures that enhance soil health, water retention, and crop resilience.
- Improve supply chain efficiency and traceability systems to ensure the safety, quality, and integrity of food products in desert regions.
- Coordinate with government agencies, UN agencies, donors, and other humanitarian actors to ensure a cohesive and effective response to food insecurity in desert regions.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Involve governments and stakeholders, to integrate climate resilience into rural agriculture to foster the community education and enabling farmers to adapt practices for effective local strategies.
- Facilitate food distribution and logistics operations in desert regions, ensuring that food reaches remote and underserved communities.
- Conduct nutrition education sessions, provide nutritional supplements, and support breastfeeding practices to prevent malnutrition and improve health outcomes.



National Academia Input
Area Academia, Think Tanks

- Academia and think tanks generate evidence-based insights into the root causes of food insecurity, including environmental degradation, climate change, poverty, and lack of access to resources
- Promoting local foods like pomegranate, olive, zizyphus are among the fruit trees which could grow in desert and semi-desert conditions and could tolerate extreme drought conditions.

International Academia Input
Area Academia, Think Tanks

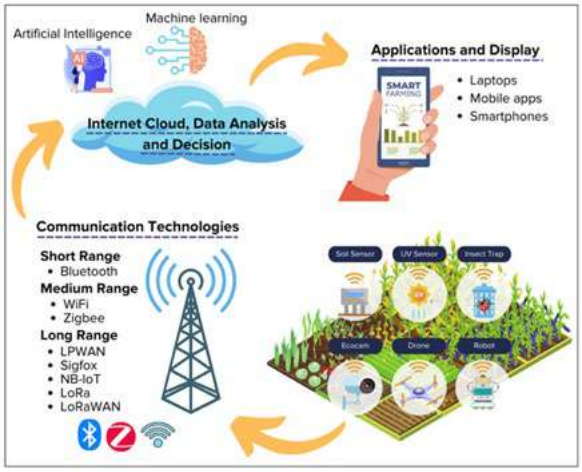
- Foster innovation and technology adoption to improve agricultural productivity, water management, and food distribution systems in desert areas
- Cultivate drought-tolerant small grain crops like millet, sorghum, and rapoko to address challenges associated with insufficient and unpredictable rainfall.
- Participate in global research networks, joint projects, and knowledge-sharing platforms to leverage global expertise and resources for local impact.

National Academia Input
Local Media and Early Warning Center

- Address food shortages in vulnerable areas, food banks and community-based food security projects should be established.
- Utilize smartphones for direct communication between farmers, institutes, and disaster management, ensuring timely weather forecasts to mitigate risks during temperature spikes.
- Attention should be paid on institutional development initiatives within major international drought and food security warning systems.

International Academia Input
Local Media and Early Warning Center

- Local media outlets serve as crucial channels for disseminating early warning information related to food security issues in desert regions.
- Engage with local communities through interactive media programs, town hall meetings, and community forums to solicit feedback, gather information, and promote dialogue on food security issues.
- Produce local content and educational materials on food security, nutrition, and agricultural best practices that resonate with desert communities



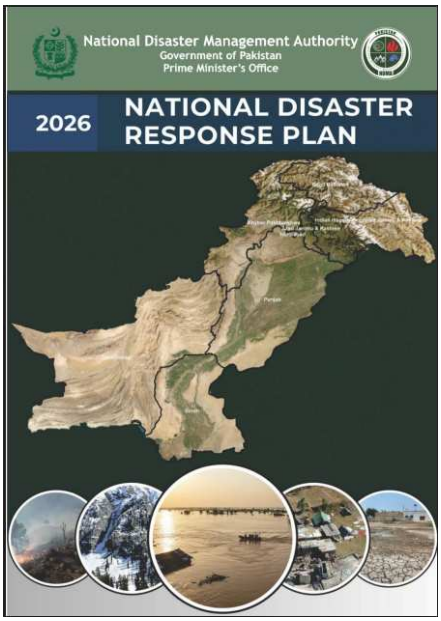
(h) Contingency – Gender Related Crises

National Academia Input
Individual & Community Level

- Establish support mechanisms within the community that take into consideration and address the individual concerns of various genders during emergencies.
- Communities in Pakistan should adopt inclusive awareness campaigns, ensuring that everyone understands the unique needs and challenges faced by different genders during crises.
- Encourage collaboration between communities globally and nationally to share insights and best practices on creating inclusive crisis management strategies.

International Academia Input
Individual & Community Level

- Conduct in-depth assessments to determine the special needs and vulnerabilities of different genders within the community during crises.
- Conduct training to community people, local organizations, and government agencies on gender mainstreaming ideas and practices.
- Communities worldwide should advocate for inclusive crisis response initiatives, emphasizing the importance of addressing diverse gender needs during emergencies.



National Academia Input
Area Governance

- Address social protection concerns within (internally displaced person) IDP camps, with specific attention to the well-being of women and children.
- The Social Welfare Department should actively contribute to child protection efforts by establishing Child Welfare Units in disaster-affected regions.

International Academia Input
Area Governance

- Advisory bodies must help in establish more resilient and inclusive communities by prioritizing economic, social, and political empowerment programs for people living in semi-desert areas.
- Develop empathy, understanding, and solidarity among varied communities.
- Develop and implement policies and strategies to address food insecurity in desert regions

National Academia Input
Role of Federal Organizations

- Encourage the adoption of sustainable livelihood strategies that are resistant to climate change and environmental deterioration.
- Raise awareness about gender equality and women's rights in desert communities through culturally sensitive approaches
- Involve women in water management and sanitation initiatives in desert areas, as they are often responsible for collecting water and managing household sanitation.

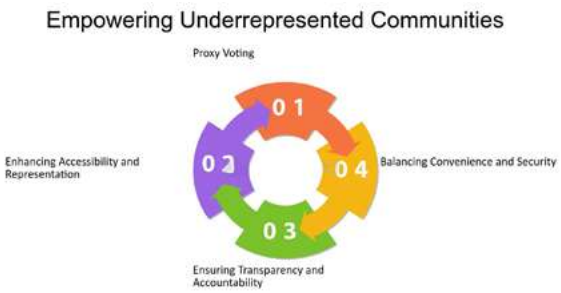
International Academia Input
Role of Federal Organizations

- Enact programs that cater to the specific needs and priorities of women, girls, and other marginalized genders.
- Advocate for the removal of structural hurdles that prevent women's empowerment, such as discriminatory legislation, cultural norms, and uneven access to resources and opportunities.

National Academia Input

Private Sector and Local Industry Role

- Train employees to understand and support each other during crises, considering gender-specific needs.
- Increase the representation and leadership of underrepresented people and communities in decision-making and advocacy efforts.



International Academia Input

Private Sector and Local Industry Role

- Collaborate with stakeholders from all sectors to establish comprehensive strategies for dismantling oppressive systems and promoting all individuals' rights and dignity.
- Support worldwide initiatives that focus on treating everyone fairly and sensitively during crisis responses.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Promote gender-responsive policies and interventions while also offering support services to survivors of gender-based violence.
- Facilitate community-led initiatives, women's groups, and gender-sensitive forums where women can voice their concerns, share experiences, and advocate for change.
- Provide training on gender mainstreaming, women's rights, and gender-sensitive programming, fostering a more inclusive and equitable approach to development

International Academia Input
NGOs, Humanitarian Resource Enablers

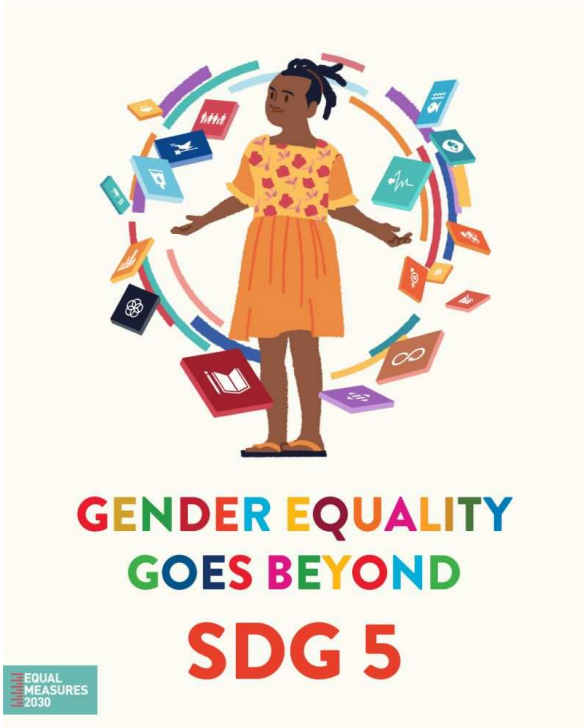
- Conduct comprehensive assessments to evaluate access to healthcare, education, sanitation, and protection services to vulnerable groups.
- Provide gender-sensitive humanitarian assistance, protection services, and psychosocial support to mitigate the impact of crises on women and promote their resilience.
- Collaborate with other stakeholders, including government agencies, UN agencies, donors, and local communities, to address gender issues in desert areas.

National Academia Input
Area Academia, Think Tanks

- Create platforms for women to share their experiences and perspectives on gender-related crises.
- Include gender-inclusive education in local academic programs to prepare for diverse needs during crises.

International Academia Input
Area Academia, Think Tanks

- Empower individuals, particularly women and girls, with self-defense training can enhance their ability to protect themselves in hazardous situations.
- Use research to influence global policies that prioritize gender sensitivity in crisis responses.



National Academia Input
Local Media and Early Warning Center

- Provide access to emergency communication channels, like hotlines or mobile apps, to seek assistance during gender-related crises.
- Promote gender-sensitive reporting by ensuring that women's voices and perspectives are represented in news coverage
- Local media outlets amplify the voices of women leaders, activists, and advocates working to address gender issues in desert areas.

International Academia Input
Local Media and Early Warning Center

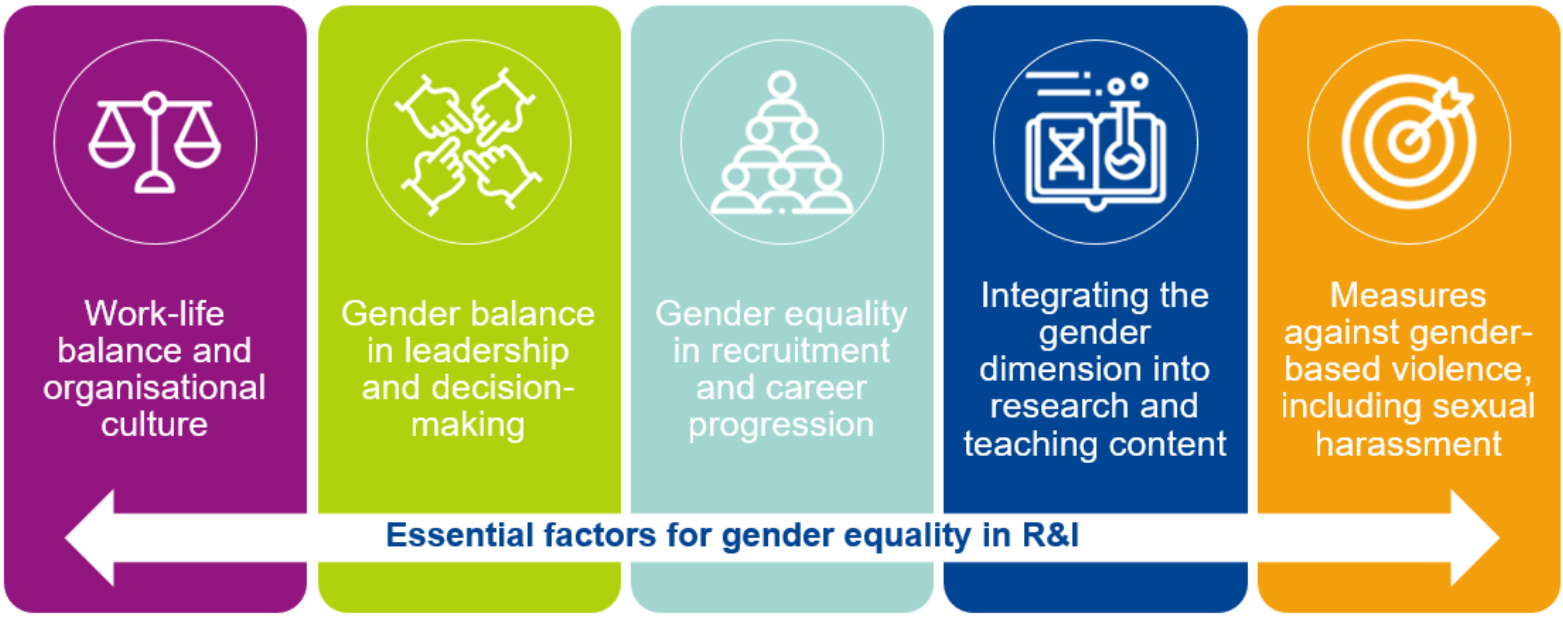
- Highlight the successful examples of gender-inclusive initiatives and resilience strategies through media coverage can inspire positive actions and encourage replication in other communities.
- Collaborate with early warning centers to ensure that gender considerations are integrated into early warning systems and disaster preparedness efforts.

National Academia Input
Search & Rescue, Law Enforcement

- Establish gender-sensitive communication.
- Efforts should be made to promote gender diversity within SAR teams and law enforcement agencies.
- Ensuring their safety and dignity, especially in high-risk situations.
- Engage with local communities to raise awareness about gender issues and empower women and girls to participate in decision-making processes.

International Academia Input
Search & Rescue, Law Enforcement

- Conduct specialized training in managing gender-related crises.
- SAR teams and law enforcement agencies should have protocols in place for responding to cases of gender-based violence in desert areas.
- Provide immediate assistance to survivors, conducting thorough investigations, and ensuring access to justice and support services
- Advocate for policies and programs that promote gender equality.



CHAPTER

4

Desert Zone

Sindh and Balochistan

(a) Contingency – Desert storms

National Academia Input
Individual & Community Level

- Ensure safety indoors by minimizing travel and keeping windows and doors closed to guard against dust infiltration.
- Promote medicinal resilience in arid areas with drought-tolerant plants like Tamarix aphylla, 'Ber' (Zizyphus mauritiana), Acacia nilotica, Dalbergia sissoo (Shisham), Eucalyptus cumuldulensis (Safeda).
- Wear dust masks or cover your mouth and nose with a cloth to prevent inhaling harmful dust particles.

International Academia Input
Individual & Community Level

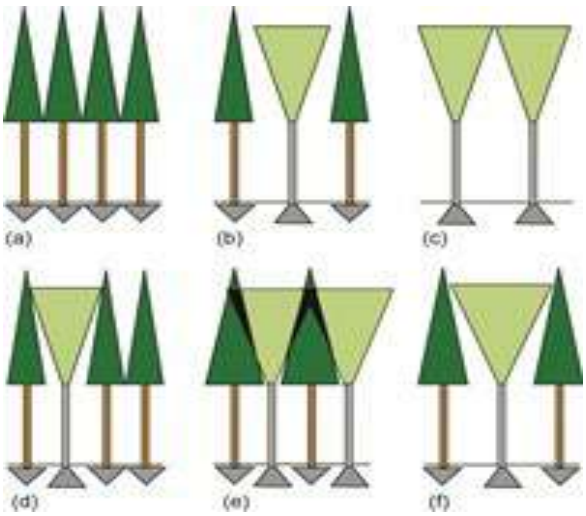
- Construct buildings and infrastructure with sealed windows, air filtration systems, and strong roofs can help to protect against dust infiltration.
- Adopt drought-resistant practices like mulching, which creates a protective barrier over the soil surface.
- Use wind breaks and shelter belts.

National Academia Input
Area Governance

- Collaborate with local authorities and agencies for coordinated disaster preparedness.
- Implement plans with early warnings, risk assessments, and address root causes for effective disaster management to combat dust storms.
- Implement policies and strategies that focus on desertification control, land management practices, and early warning systems.

International Academia Input
Area Governance

- Assign community shelters for residents to seek protection during desert storms.
- Build resilient structures capable of enduring powerful winds and flying debris.
- Successful implementation of mixed-species tree belts to decrease wind speed, reduce erosion, and improve soil conditions.
- Support afforestation and reforestation to stabilize soil and combat desertification.



National Academia Input
Role of Federal Organizations

- Recognize and allocate emergency shelters in susceptible regions.
- Conduct regular public awareness on the impacts of dust storms.

International Academia Input
Role of Federal Organizations

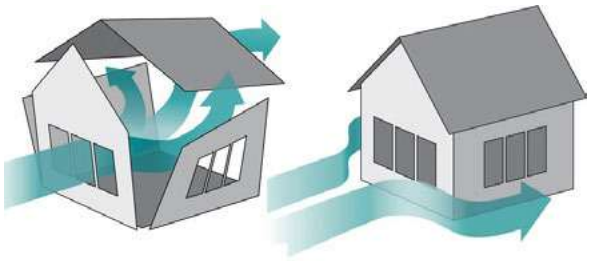
- Establishment of community nurseries to cultivate drought resistant plants and organizing efforts for tree plantation.
- Implement stabilization techniques such as mechanical methods (palisades), chemical approaches (calcium bentonite or silica gel), and biological methods (mulching and establishing plant cover) for sustainable control.

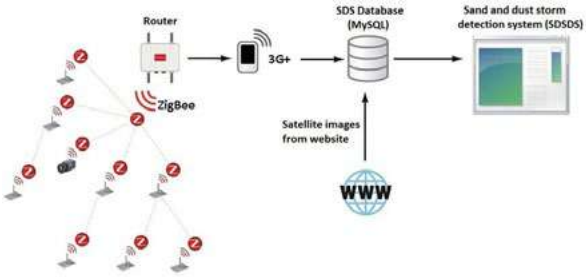
National Academia Input
Private Sector and Local Industry Role

- Develop storm-resistant buildings through structural reinforcement in industrial and private sectors.
- Educate employees, stakeholders, and local communities through awareness initiatives to boost preparedness and resilience to desert storms.

International Academia Input
Private Sector and Local Industry Role

- Deploy early warnings, remote sensing, and mobile apps for real-time responses.
- Establish hubs and incubators to promote collaboration among the private sector, academia, and government for innovative solutions against desert storms.





National Academia Input
NGOs, Humanitarian Resource Enablers

- Provision of aid to affected people.
- Allocate resources for better meteorological monitoring, ensuring accurate desert storm predictions and enabling timely proactive responses.

International Academia Input
NGOs, Humanitarian Resource Enablers

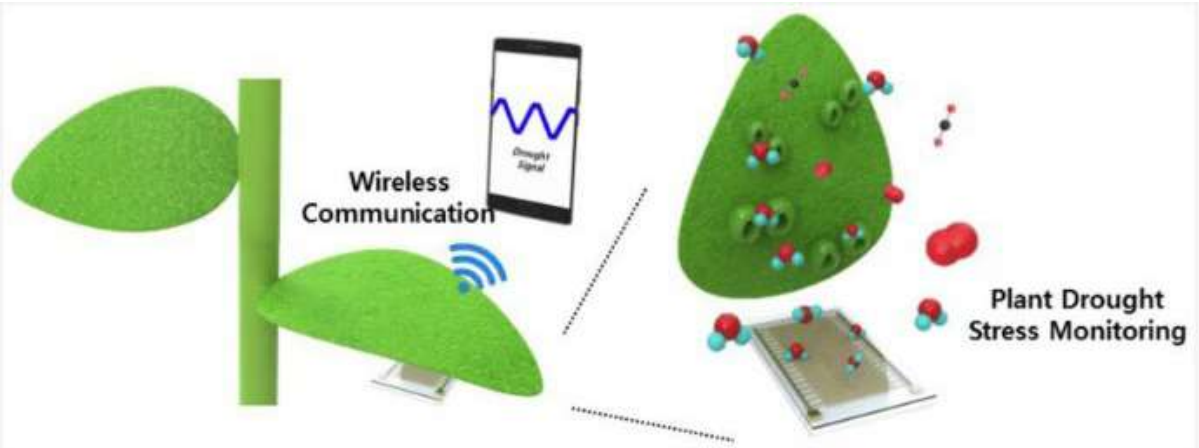
- Provisions of Personal Protective Equipment (PPEs) such as goggles, masks, clothing, shoes.
- Provide training on desert storm safety procedures, including evacuation plans and first aid.

National Academia Input
Area Academia, Think Tanks

- Educate biomedical and meteorological experts jointly about dust storms.
- Cultivate drought-tolerant trees and shrubs which helps in soil stabilization, erosion reduction, and the attenuation of the intensity of storms in deserts.
- Grow drought-resistant crops like mungbean, chickpea, cowpea, and wheat.

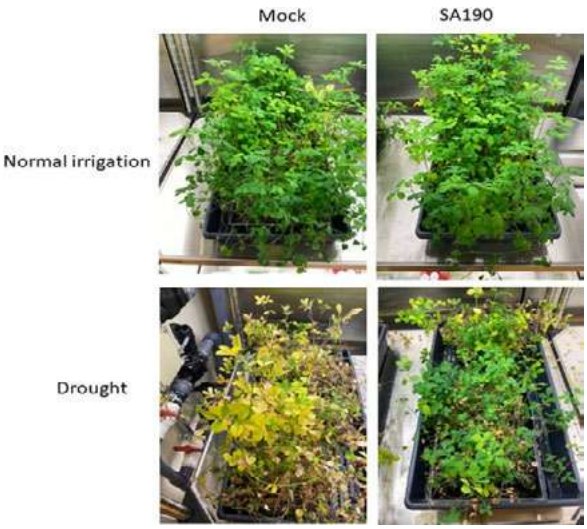
International Academia Input
Area Academia, Think Tanks

- Utilize total-sky cameras and webcams for effective dust early warning casting in remote sites.
- Use Sun photometers and radiometers for dust monitoring and characterization.
- Utilize the Pseudomonas argentinensis strain (bacterial specie) SA190 gene for enhanced drought stress resilience.



National Academia Input
Local Media and Early Warning Center

- Warnings should be issued through television, radio, newspapers, and social media.
- Promote educational campaigns (informing tips related to self-protection).



International Academia Input
Local Media and Early Warning Center

- Media can be helpful in providing information regarding emergency shelters, rescue teams, transportation and medical facilities available in affected areas.
- Conduct disaster education training for enhanced preparedness.

National Academia Input
Search & Rescue, Law Enforcement

- Efficiently position key resources for effective response during sandstorms including medical supplies, protective gear, and vehicles.
- Enforce road closures, traffic diversions, and other measures to prevent accidents and ensure the safety of residents and emergency responders.
- Deploy personnel and assets for flood relief and conduct search and rescue operations during flood incidents, emphasizing a comprehensive and coordinated response.

International Academia Input
Search & Rescue, Law Enforcement

- Ensure that trained teams are pre-mobilized for efficient search and rescue operations, utilize helicopters, drones, and ground teams to locate and assist individuals or distressed communities.
- SAR teams and law enforcement agencies often work together to coordinate emergency response efforts during desert storms.

(b) Contingency – Rising Temperatures, Abnormal Heat

National Academia Input
Individual & Community Level

- Avoid exposure to heat waves by avoiding activities during peak hours.
- Drink more water and juices (sattu, mint) and stay hydrated
- Using natural materials such as cotton or wool.
- Take a bath with the neem water.
- Combine recycled elements with locally sourced materials for aid items, capitalizing on their standardized nature.
- Use evaporative cooling techniques by wetting a surface like cloth or mat, allowing water to evaporate and naturally cool down.

International Academia Input
Individual & Community Level

- Stay indoors in air-conditioned/ ventilated spaces as much as possible.
- Avoid strenuous activities during the hottest part of the day and take frequent breaks in the shade or indoors.
- Wearing loose-fitting, lightweight, and light-colored clothing.
- Use water infused with 'palash flower' extracts for a rejuvenating experience.
- Use low-tech, high-efficiency methods like a double-roof system and walls constructed with plastic bags filled with compacted earth for effective cooling in refugee camps.
- Stay informed about heat wave warnings and updates from local authorities.

National Academia Input
Area Governance

- Install of mist fans or water sprinklers.
- Create more cooling shelters.
- Adopt sustainable irrigation systems like drip irrigation or recycled water systems can contribute significantly to water conservation efforts.
- Use materials with higher solar reflectance that can help to reduce heat absorption and lower surface temperatures, thereby mitigating the heat island effect.

International Academia Input
Area Governance

- Install passive cooling towers to capture cooler winds and redirect them into living spaces displaces warm air, enhancing cooling efficiency and reducing energy consumption.
- Adopt energy-efficient practices.
- Use smart irrigation technologies which involves sensors and data analysis to adjust watering schedules based on plant requirements and weather patterns.
- Use green roofs and walls to reduce ambient temperatures by up to 5 degrees Celsius.

National Academia Input
Role of Federal Organizations

- Construct thick-walled houses using materials like adobe (soil, water, and organic additives) or stone for insulation against high temperatures.
- Include green spaces such as parks, gardens in Urban planning that can benefit greatly from green spaces as they serve important functions.

International Academia Input
Role of Federal Organizations

- Install of solar powered appliances such as fans and air conditioners to stay cool and comfortable.
- Grow Trees, grass, and other vegetation that can help lower temperatures by providing shade and evaporative cooling.

National Academia Input
Private Sector and Local Industry Role

- Use solar panels to harness natural energy for summer cooling.
- Invest in highly insulative building materials for improved energy efficiency in construction.
- Installation of awnings in private residencies or elderly people homes.

International Academia Input
Private Sector and Local Industry Role

- Optimize orientation and window size for efficiency.
- Companies must assess and reduce their carbon footprint, compensating for any remaining emissions.
- Make use of carved mashrabiya screens, crafted from wood, stone, or plaster, effectively blocks and diffuses sunlight that promotes airflow into living spaces, and ensures privacy, enhancing comfort and aesthetic appeal.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Deploy personnel to vulnerable locations.
- Provide ORS, medicines, and conduct tree plantation activities for community well-being.

International Academia Input
NGOs, Humanitarian Resource Enablers

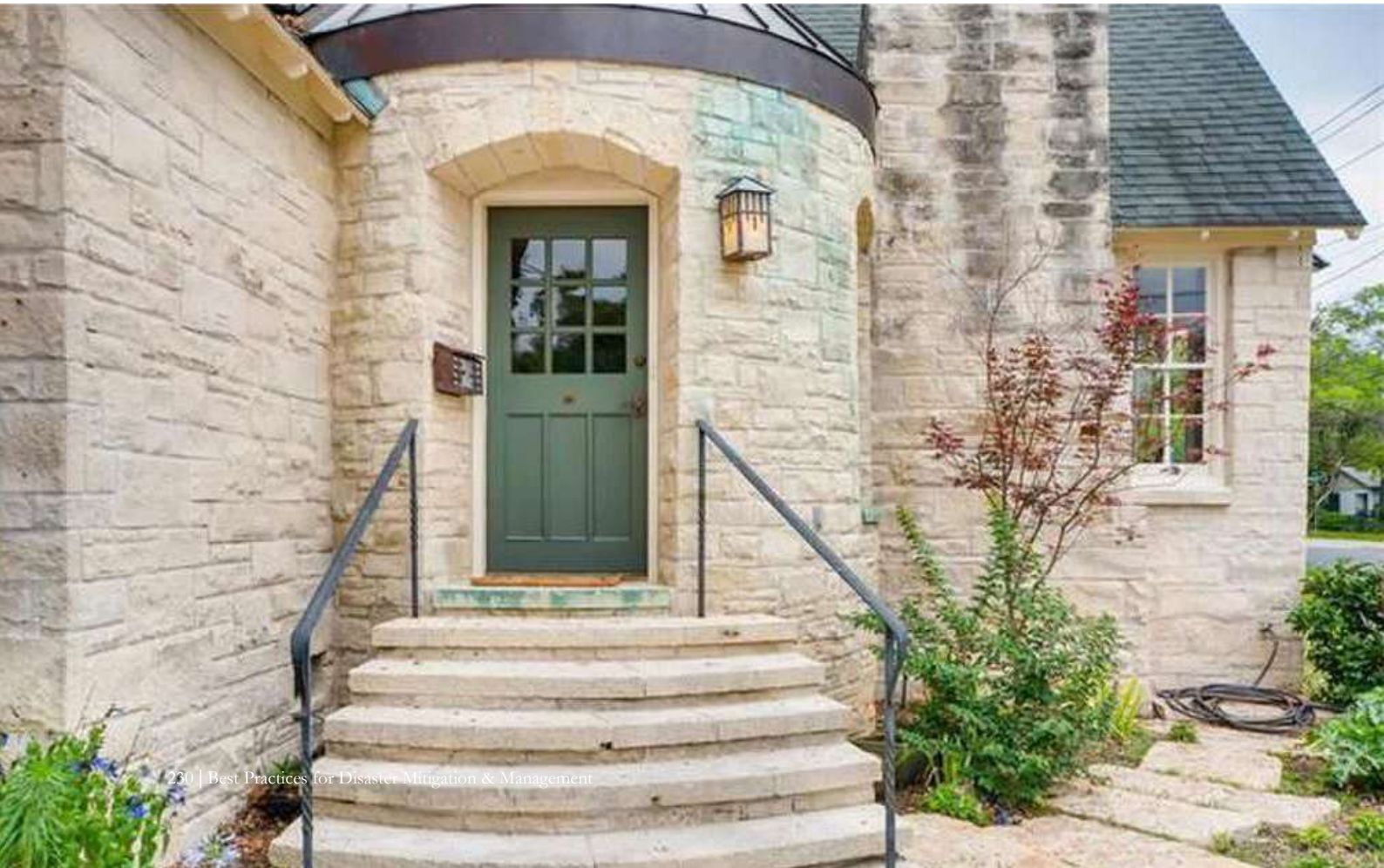
- Provide essential health services, nutrition supplements, counseling, preschool activities, and awareness programs for children.
- Guide individuals to nearby response centers for assistance by collaborating with social welfare organizations

National Academia Input
Area Academia, Think Tanks

- Promote green spaces in urban areas.
- Encourage the use of heat-resistant paints (containing boric acid and calcium chloride), chemical prophylaxis, and processed foods.

International Academia Input
Area Academia, Think Tanks

- Choose homes with limestone and natural materials to naturally control humidity, absorbing moisture in humid conditions and releasing it on sunny days.
- Use of sandy texture that reflects solar radiation, providing effective cooling for a comfortable living environment.
- Maximize shade by building narrow roads and alleys that offer natural relief from sunlight.

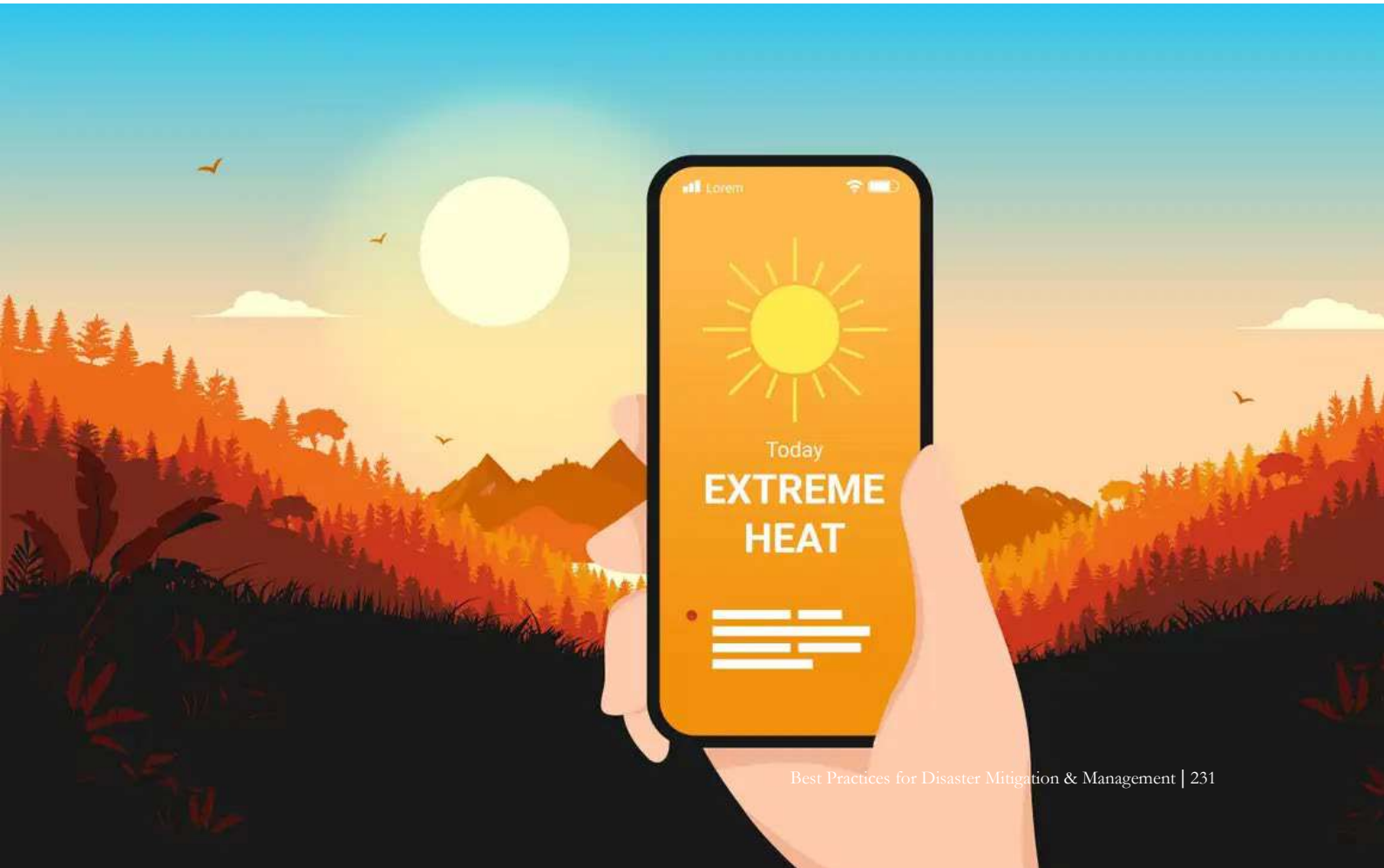


National Academia Input
Local Media and Early Warning Center

- Create Awareness for planners, architects, local administration and the policymakers.
- Disseminate accurate information about impending heatwaves, educating the public about the dangers of extreme heat, and providing tips on how to stay safe and cool during heat waves.

International Academia Input
Local Media and Early Warning Center

- Use simple language and visual aids like symbols to accompany spoken or written warnings.
- Regular monitoring of weather patterns and issuing early warnings about potential heatwaves, allowing authorities and communities to take proactive measures to mitigate their impact.

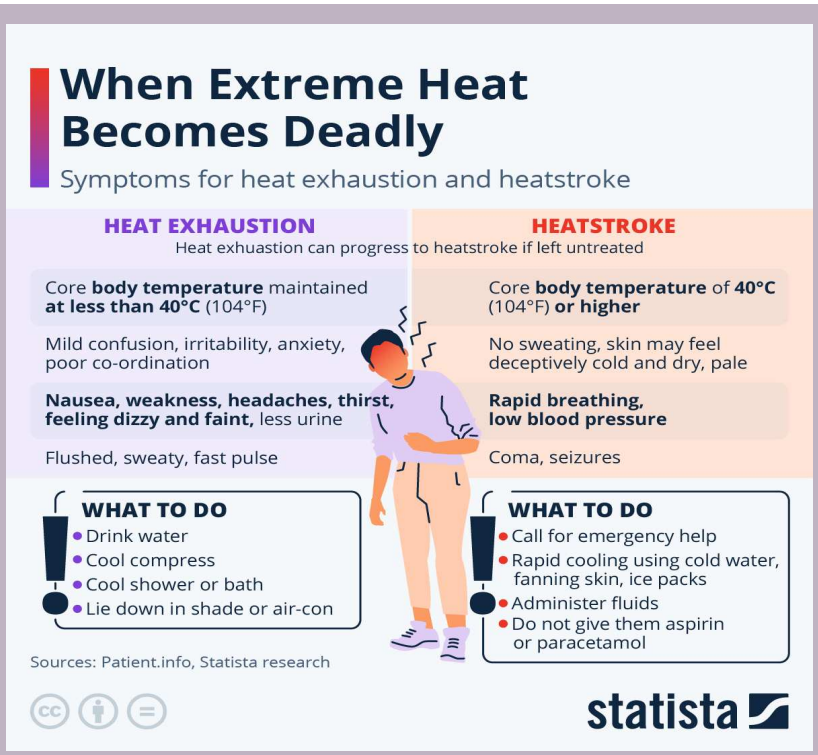


National Academia Input
Search & Rescue, Law Enforcement

- Establishment of heat stroke hospitals/centers and district hospitals during summers.
- Locating and rescuing individuals who may be at risk due to the heat, such as hikers, elderly individuals, or those experiencing heat-related illnesses.

International Academia Input
Search & Rescue, Law Enforcement

- Ambulances should initiate early cooling treatment upon picking up the patient.
- Coordinate with other emergency response agencies to provide medical assistance and evacuate individuals from dangerous situations.



(c) Contingency – Prolonged Drought / Water Scarcity

National Academia Input
Individual & Community Level

- Create water ponds and storage tanks to preserve fresh water effectively.
- Plant drought resilient crops (sesame), or considering agricultural insurance.
- Actively engage in recharging aquifers and manage both surface water and groundwater resources through conjunctive use for sustainable water management.
- Embrace indigenous practices like Tobas, Kunds, Wells, and Tubewells for sustainable water conservation.

International Academia Input
Individual & Community Level

- Focus on Agronomic measures like Soil management techniques and Protective barriers
- Promote Agri-Voltaics (combining agriculture and solar panels).
- Use carboxymethyl cellulose sodium (CMC-Na) to improve water retention and sand fixation as a control practice.

National Academia Input
Area Governance

- Implement design strategies such as the use of resilient materials, thoughtful building design, and geothermal heating/cooling systems.
- Undertake a cost-benefit analysis to assess the inclusion of water scarcity/drought adaptation features.

International Academia Input
Area Governance

- Adopt non-conventional water resources and water saving irrigation techniques.
- Promote recycling of rainwater, integrate wetlands, and utilize terrain for water retention and purification, addressing water scarcity by replenishing groundwater.

National Academia Input
Role of Federal Organizations

- Implement solar or wind power for agricultural adaptation, incorporating management applications such as crop types and land management.
- Implement spate irrigation and localized runoff systems.
- Establish monitoring systems for soil, moisture level, and weather conditions.

International Academia Input
Role of Federal Organizations

- Prepare plans and policies related to water management and harvesting.
- Conduct pre-impact governance programs to strengthen resilience, reduce vulnerability and minimize impacts (mitigation).
- Implement post impact crisis management programs (regarding emergency response procedures).

National Academia Input

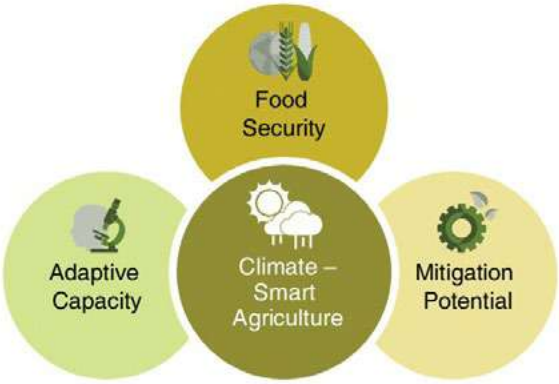
Private Sector and Local Industry Role

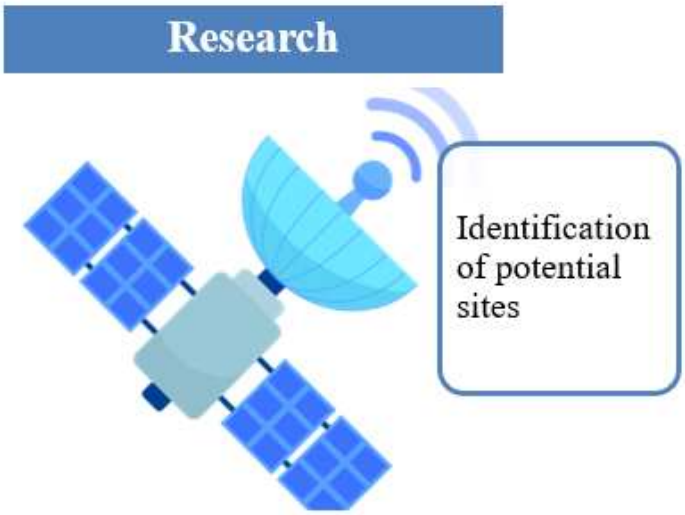
- Use Drought Monitoring and Forecasting Systems (DMFS).
- Initiate rainwater harvesting projects in conjunction with ongoing watershed development efforts in desert regions.

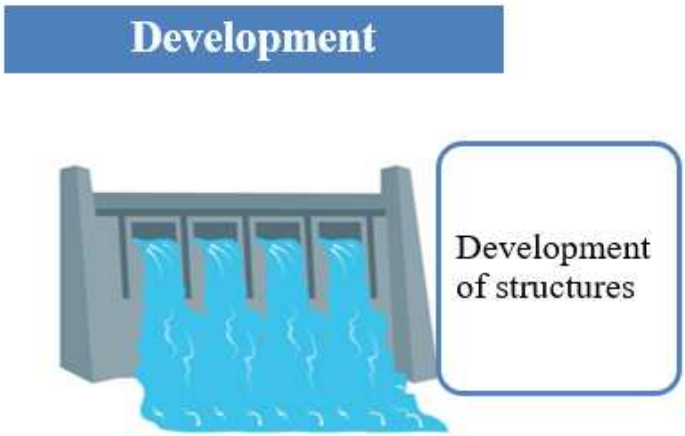
International Academia Input

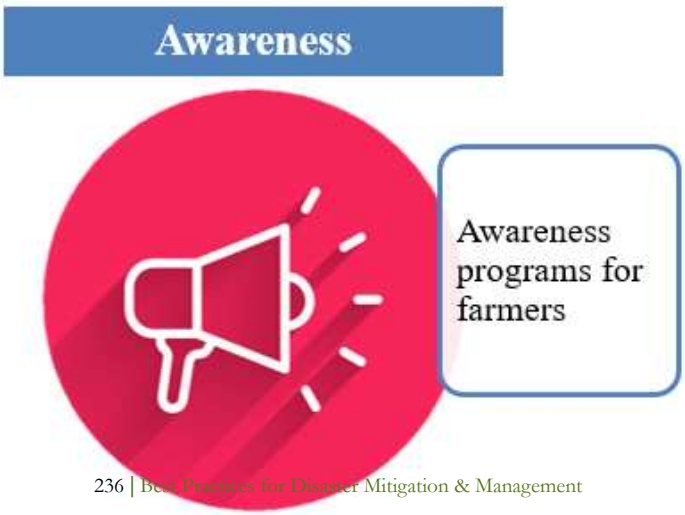
Private Sector and Local Industry Role

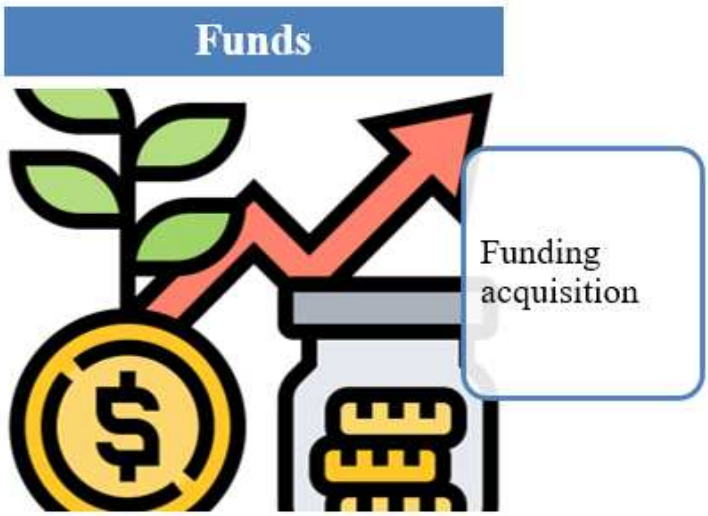
- Production and use of improved seed varieties and livestock breeds.
- Equip farmers with technologies, knowledge, and skills for climate-smart agriculture.











National Academia Input
NGOs, Humanitarian Resource Enablers

- Provision of food and water under drought conditions.
- Provide relief in form of food, water, renewable energy and education.

International Academia Input
NGOs, Humanitarian Resource Enablers

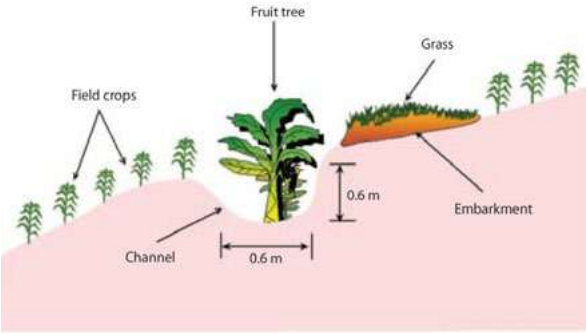
- Distribute and cultivate resilient seeds, trees and bushes adapted to desert conditions, ensuring reliable food sources for communities.
- Promote water management through initiatives, advocating for sustainable water use and offering solutions to combat water scarcity.

National Academia Input
Area Academia, Think Tanks

- Conduct research on efficient irrigation methods, farm layout and balanced use of fertilizers and pesticides.
- Ensure effective water supply via irrigation channels to address water shortages.
- Educate farmers to maximize the benefits of available water sources and optimization of water usage.
- Use of traditional zai (small basins used to capture surface runoff) and earthen bunds.

International Academia Input
Area Academia, Think Tanks

- Use efficient water technologies such as drip irrigation, laser leveling, raised bed planting.
- Use ridges, fanya juus infiltration pits, contour stone bunds and semi-permeable stone bunds as water harvesting techniques.
- Utilizing nylon nets to capture fog, converting it into water droplets that provides a substantial daily source of water for bathing, washing, and cooking purposes.



National Academia Input
Local Media and Early Warning Center

- Ensure the availability of internet access across districts susceptible to drought.

International Academia Input
Local Media and Early Warning Center

- Media coverage and SMS text alerts.

National Academia Input
Search & Rescue, Law Enforcement

- Establish efficient ambulance services for swift transfers of patients from remote villages to major hospitals in urban centers.

International Academia Input
Search & Rescue, Law Enforcement

- Develop relief programs, including self-help initiatives, for drought-prone regions.
- Design programs to address the specific needs of environmental refugees.

(d) Contingency – Ecosystem Imbalance

National Academia Input
Individual & Community Level

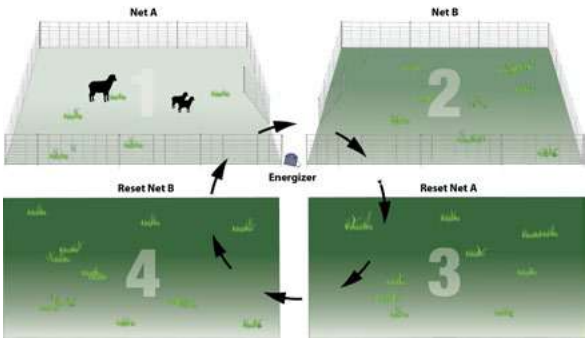
- Grow leguminous plants that can help restore soil fertility.
- Participate in local environmental education programs promoting ecological literacy and offer training to other communities on sustainable farming practices.

International Academia Input
Individual & Community Level

- Dig artificial grooves in the ground to retain rainfall and trap windblown seeds.
- Raise awareness among employees, colleagues, family, friends, and the community about the significance of preserving ecosystems.

National Academia Input
Area Governance

- Promote biodiversity restoration techniques such as protection of National parks, animal reserves, and other conservation zones practiced in Pakistan.
- Promote approaches like biocultural conservation, climate-smart management, and biosecurity aid in addressing challenges arising from climate change, human needs and invasive species,



International Academia Input
Area Governance

- Rotational grazing may assist to minimize overgrazing and sustain healthy desert ecosystems.

National Academia Input
Role of Federal Organizations

- Educate policymakers, planners, and administrators on biodiversity.

International Academia Input
Role of Federal Organizations

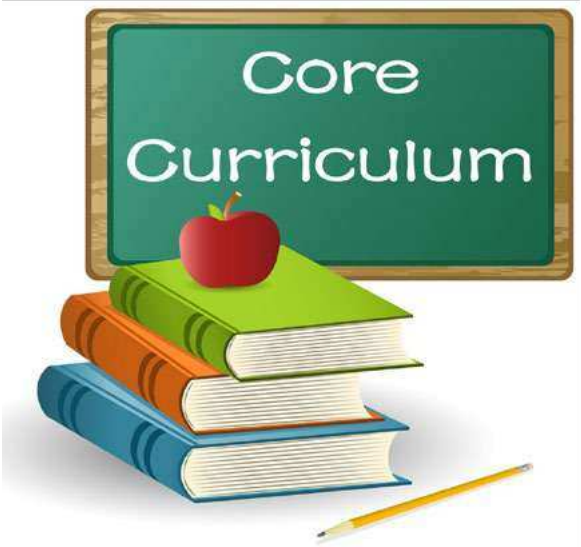
- Encourage the use of renewable energy sources such as solar and wind power.

National Academia Input
Private Sector and Local Industry Role

- Integrate biodiversity education into national curricula at all levels, with a focus on schools, colleges, and universities, emphasizing its importance, principles, and repercussions.

International Academia Input
Private Sector and Local Industry role

- Combat desertification and encourage afforestation.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Relief organizations must ensure effective communication of vital information to affected communities for optimal response and support.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Launch impactful awareness campaigns to inform the public about potential disasters, consequences, and recommended actions.
- Motivate individuals to prioritize safety and community well-being.

National Academia Input
Area Academia, Think Tanks

- Enhance biodiversity understanding, knowledge, and conservation measures.
- Plant desert-friendly flora like (Calligonum polygonoides, Aerva javanica, Dipterygium glaucum, Limeum indicum).
- Control of non-native species.

International Academia Input
Area Academia, Think Tanks

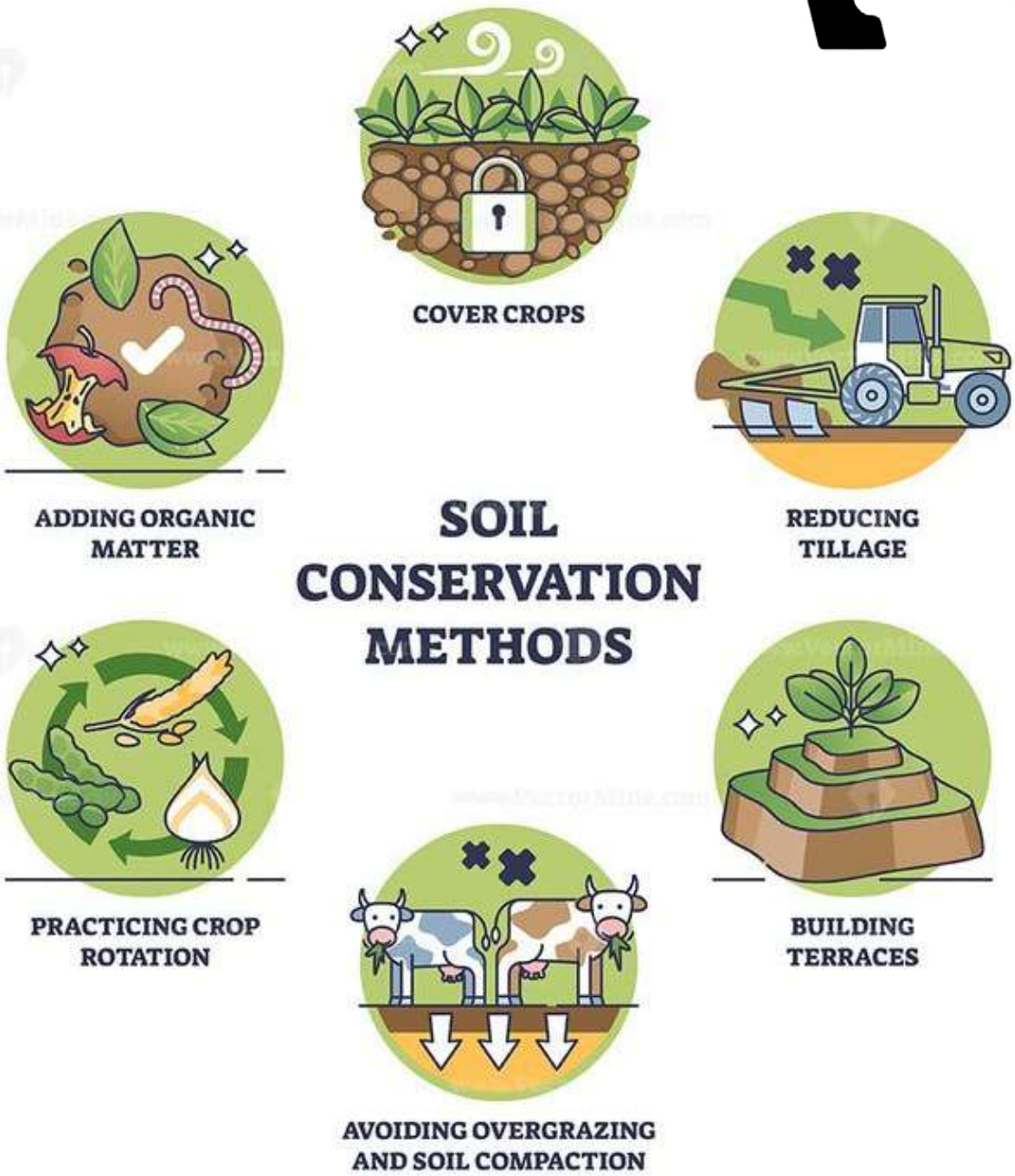
- Adopt Liquid Nano Clay technique for water retention and clay nutrient level enhancement for transforming arid soil into fertile ground.
- Implement soil manipulation techniques such as additives, contouring and stabilizing.
- Native plant restoration.

National Academia Input
Local Media and Early Warning Center

- Conduct awareness programs, campaigns, and workshops about the importance of desert water conservation through media.

International Academia Input
Local Media and Early Warning Center

- Launch awareness initiatives for the community.



National Academia Input
Search & Rescue, Law Enforcement

- Locate and rescue survivors.
- Provide medical care.
- Maintain communication network.

International Academia Input
Search & Rescue, Law Enforcement

- Train search and rescue team for specific ecosystems.
- Enforce environmental laws and regulations for safeguarding ecosystem.

(e) Contingency – Earthquakes

National Academia Input
Individual & community level

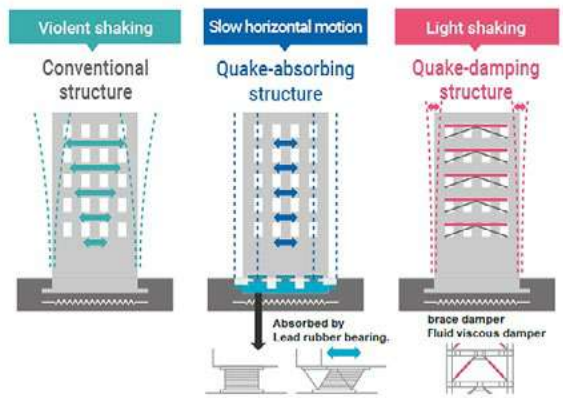
- Prepare a disaster supply kit with essentials like water, food, medications, and first aid supplies for at least three days.
- Educate the community about earthquake risks and provide training on how to respond during and after an earthquake.

International Academia Input
Individual & community level

- Create and practice a family emergency plan.
- Regularly inspect and maintain critical infrastructure such as bridges, dams, and utilities.

National Academia Input
Area Governance

- Implement and adopt building/seismic codes of already existing and new facilities.
- Enforce and adhere to strict building codes to ensure structures are earthquake resistant.



International Academia Input
Area Governance

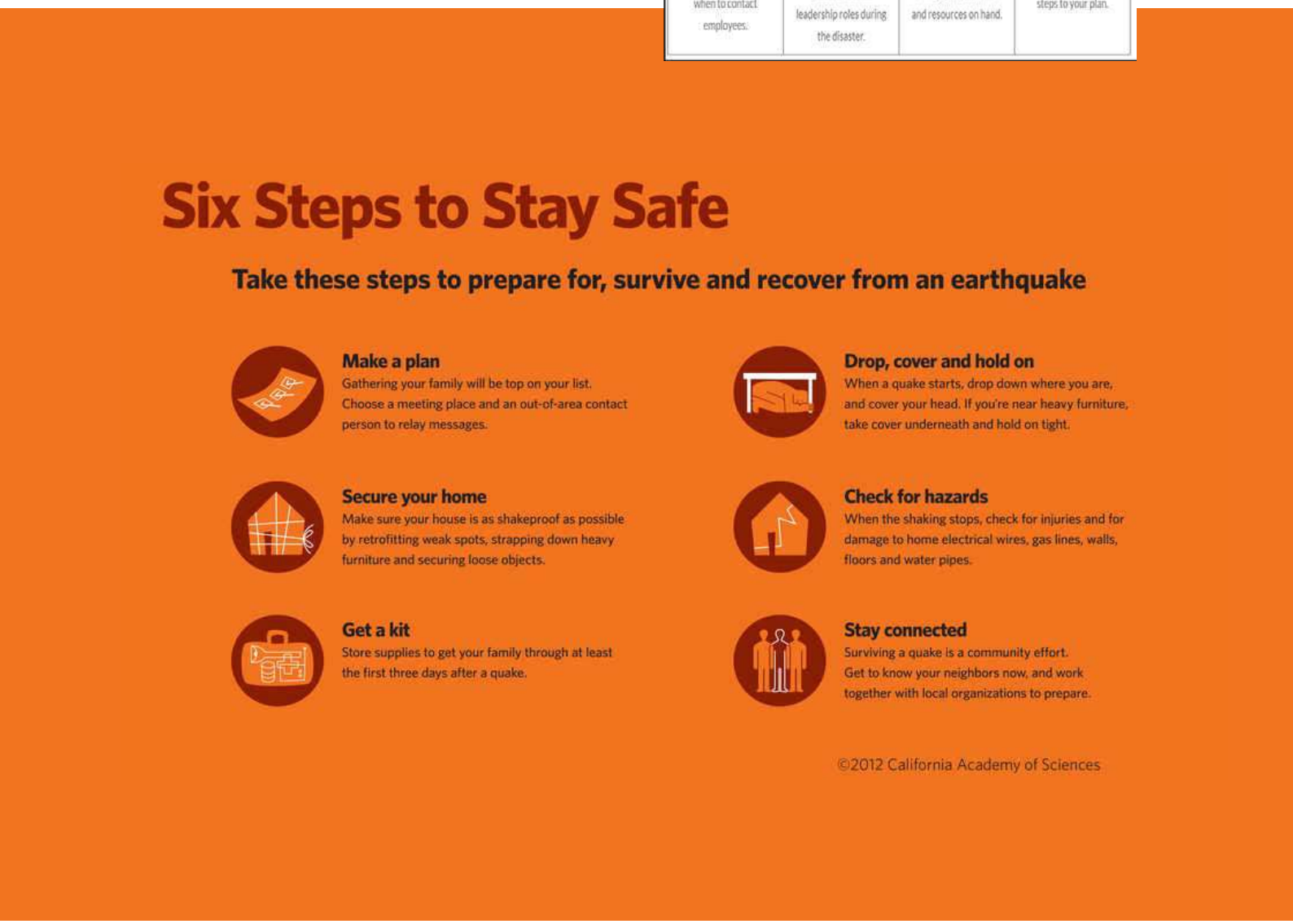
- Develop detailed vulnerability maps that pinpoint critical infrastructure elements most susceptible to earthquake damage, considering factors like soil type, track alignment, and bridge design.
- Conduct regular earthquake drills at home, school, and work to ensure everyone knows what to do in an earthquake.

National Academia Input
Role of Federal Organizations

- Federal agencies should collaborate with provincial and local authorities particularly with the earthquake prone areas to develop and implement comprehensive earthquake risk management plans, incorporating hazard assessments, building codes, and emergency response protocols.
- Ensure the availability of safe and accessible shelters for displaced populations, providing essential services like food, water, sanitation, and healthcare.

International Academia Input
Role of Federal Organizations

- Develop plans, programs and establish mechanisms for raising awareness of common people, professionals and authorities on earthquake contingency plans.
- Develop rapid response mechanisms to deploy social workers and volunteers to affected areas immediately after an earthquake.



National Academia Input

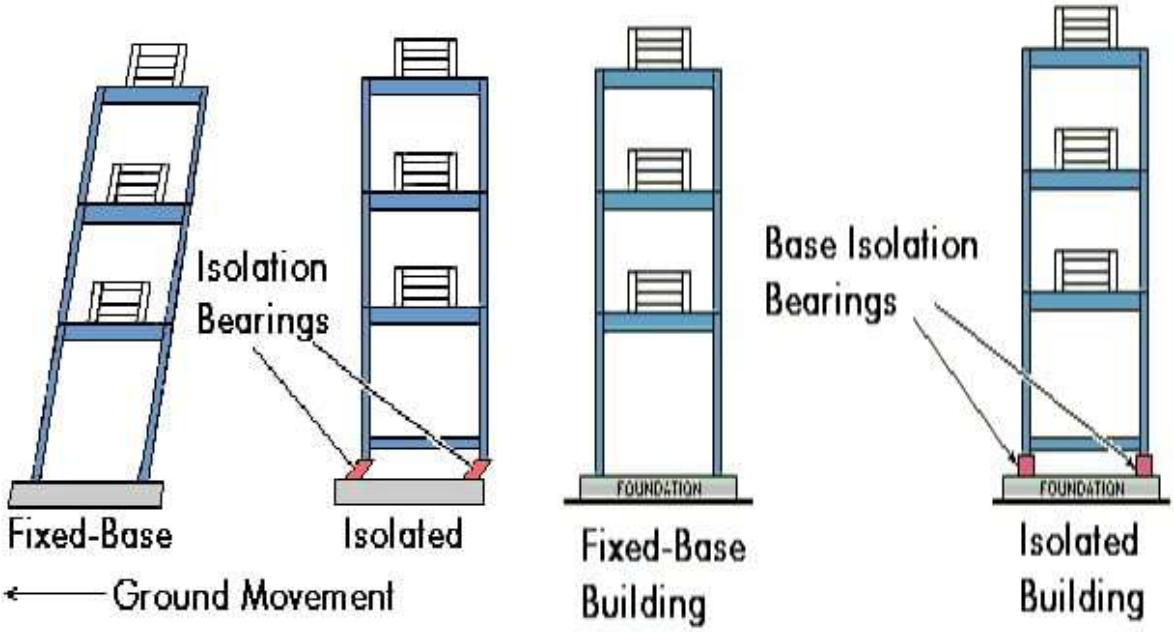
Private Sector and Local Industry Role

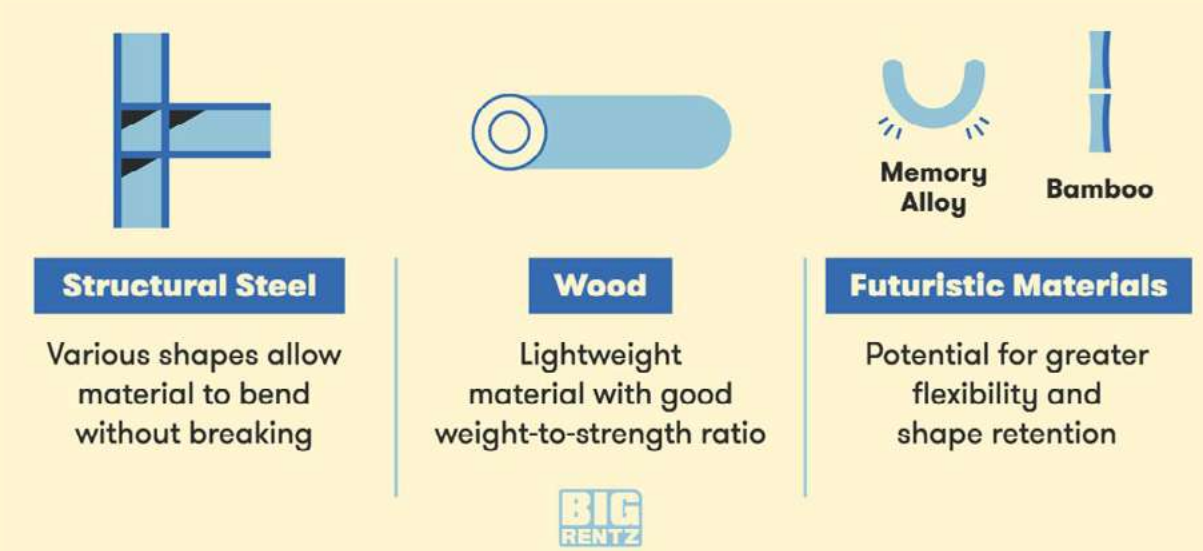
- Produce earthquake resistant building materials that are specifically designed to withstand seismic forces.

International Academia Input

Private Sector and Local Industry Role

- Develop advanced earthquake resistant engineering technologies for design of buildings.





National Academia Input
NGOs, Humanitarian Resource Enablers

- Plan area wise procedures for search and rescue operations, medical aid distribution, damage assessment and resource allocation.
- Outline seismic zone wise procedures for search and rescue operations, medical aid distribution, damage assessment, resource allocation, and communication protocols in the aftermath of an earthquake.
- Create easy-to-understand content in local languages, such as brochures, posters, and videos, to convey crucial information about earthquake preparedness.
- Work with homeowners and public institutions to identify and prioritize retrofitting critical infrastructure and buildings, focusing on schools, hospitals, and shelters.

International Academia Input
NGOs, Humanitarian Resource Enablers

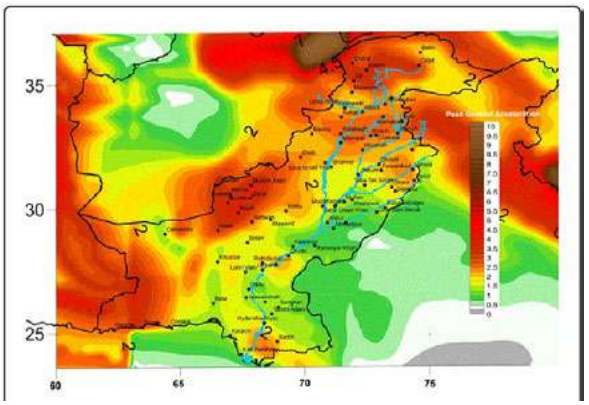
- Work with local communities and authorities to identify areas most vulnerable to earthquakes consider factors like housing quality, infrastructure access, and population density.
- Develop clear and practical plan setting out roles, responsibilities and processes for carrying out initial damage assessment immediately following a major earthquake, and communicate the plan to all who will have a role in damage assessment.
- Use visual aids such as illustrations, diagrams, and infographics to supplement written content and enhance understanding, mainly for individuals with low literacy level.
- Build trust and partnerships with local communities through participatory risk assessments, awareness campaigns, and capacity-building workshops.

National Academia Input
Area Academia, Think Tanks

- Conduct comprehensive seismic hazard mapping including active fault zones, and regions with high seismic risk and assess potential impacts on infrastructure, communities, and ecosystems.
- Train and equip researchers, disaster management personnel, and University students with the necessary skills and knowledge to effectively manage earthquake risks.
- Include lessons in national curricula to teach about earthquake science, risk assessment, disaster management, and community resilience.

International Academia Input
Area Academia, Think Tanks

- Organize drills in schools, colleges and universities.
- Conduct extensive research to analyze past earthquakes, monitor current seismic activity, and develop predictive models.
- Conduct earthquake awareness training in academic institutions for educating students about the risks associated with earthquakes and preparing them to respond effectively in case of an earthquake.



National Academia Input
Local Media and Early Warning Center

- Train construction workers.
- Evaluate, test and deploy early warning systems.
- Establish robust network of seismic sensors strategically placed across the country to detect seismic waves and trigger timely alerts to at risk communities and authorities.

International Academia Input
Local Media and Early Warning Center

- Launch awareness campaigns to educate citizens about earthquake safety, preparedness measures, and early warning systems.
- Develop a seismic monitoring and early warning system to provide rapid and accurate alerts to individuals, communities, and organizations.

National Academia Input
Search & Rescue, Law Enforcement

- Establish firefighting, search and rescue team.
- Establish a line of responsibility and measures to assess the safety of buildings following earthquakes, and decide on evacuation, repair and preoccupancy procedures.
- Pakistan should enact legislation requiring public schools to establish emergency preparedness systems, including disaster plans and preparedness training for both staff and students.
- Setting up search and rescue infrastructure and services to act as the primary responders in post-earthquake scenarios.

International Academia Input
Search & Rescue, Law Enforcement

- Provision of earthquake preparedness kits containing water bottles, nonperishable food and first aid boxes.
- Identify critical infrastructure elements most susceptible to earthquake damage, like buildings, bridges, power lines, water pipelines, and communication networks.
- Improve school safety and family readiness by making preparedness activities an integral part of the school year.
- Regular building inspection operations should be conducted to avoid the catastrophic impacts of an earthquake.

(f) Contingency – Epidemics, Vector Borne Diseases

National Academia Input
Individual & Community Level

- Utilize neem as a biopesticide to effectively destroy nymphs.
- Exercise crucial interventions like Insecticide-Treated Nets (ITNs), Indoor Residual Spraying (IRS), Larval Source Management (LSM), and Fogging Operations to prevent disease spread and mitigate health and economic consequences.

International Academia Input
Individual & community level

- Apply insecticides and biopesticides using ultra-low volume (ULV) oil-based formulations (mixed with malathion and lambdacyhalothrin) with specialized vehicle-mounted sprayers for effective pest management.
- Use smoke, conventional insecticides, biopesticides, metallic wares, loud music, night firing, and musical instruments for effective pest management.

National Academia Input
Area Governance

- Enhance surveillance and control methods for better effectiveness.
- Test water supply lines for reliability and functionality.
- Monitor drinking water sources, injuries, and vector populations for effective prevention of diseases.

International Academia Input
Area Governance

- Build health facilities.
- Countries must have clear contingency plans outlining necessary actions before, during, and after emergencies.
- Adopt intercropping like combining maize and sorghum with insect repellant (Desmodium and Brachiaria) to maximize maize production and reduce stem-boring insects.

National Academia Input
Role of Federal Organizations

- Strengthen monitoring networks, exchange epidemiological data, and coordinate responses for transboundary epidemics impacting desert zones with neighboring nations and international organizations.

International Academia Input
Role of Federal Organizations

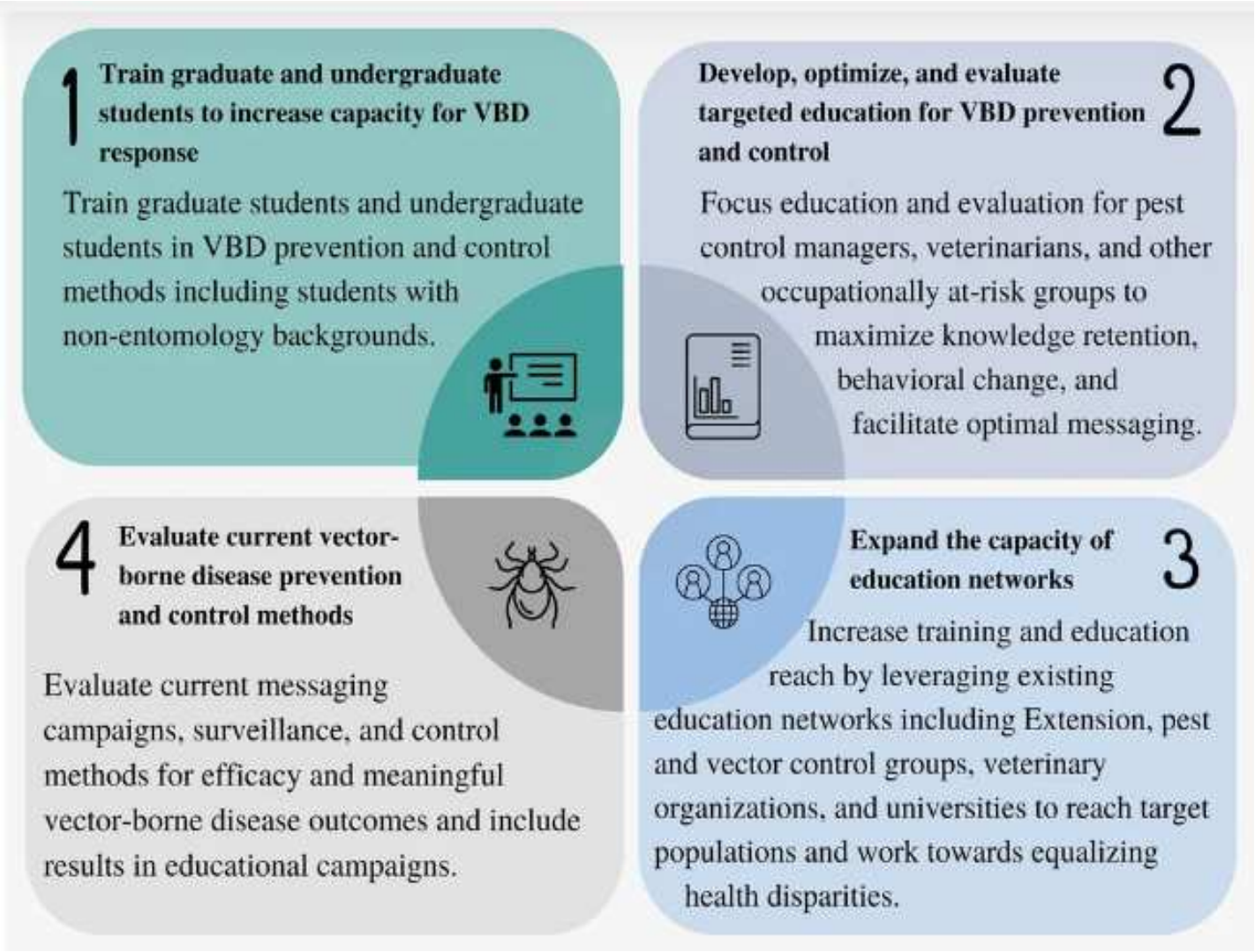
- Coordinate across ministries of sectors, including healthcare, agriculture, academia, and transportation, trade and industry to implement integrated epidemic response plans and to ensure disinfection through UV radiations, sanitizing sprays.

National Academia Input
Private Sector and Local Industry Role

- Deign better vaccines to protect against infections.

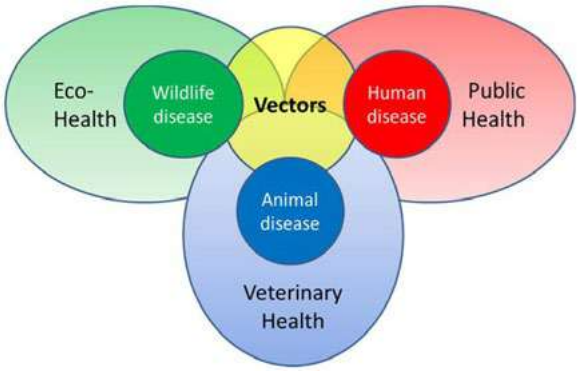
International Academia Input
Private Sector and Local Industry Role

- Conduct diverse health professional training on vector-borne diseases (VBDs) with multidisciplinary impacts, prevention identification.
- Provide training to emergency, provincial, protective, and family health workers.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Support malaria and vector-borne diseases (VBDs) response in humanitarian emergencies, engaging diverse actors, including local NGOs and private sector entities."



International Academia Input
NGOs, Humanitarian Resource Enablers

- NGOs can partner with local health authorities to set up robust disease surveillance for early detection of epidemics and vector-borne diseases, facilitating prompt responses.

National Academia Input
Area Academia, Think Tanks

- Apply repellent pesticides made locally, combining livestock urine and various botanical plants with pesticidal effects for effective pest control.

International Academia Input
Area Academia, Think Tanks

- Install sensors for desert locust and use semi chemicals to inhibit its phase transformation.

National Academia Input
Local Media and Early Warning Center

- Provision of temporary extra WASH facilities and public messaging.
- SMS alert regarding spread of disease and its effective treatment.

International Academia Input
Local Media and Early Warning Center

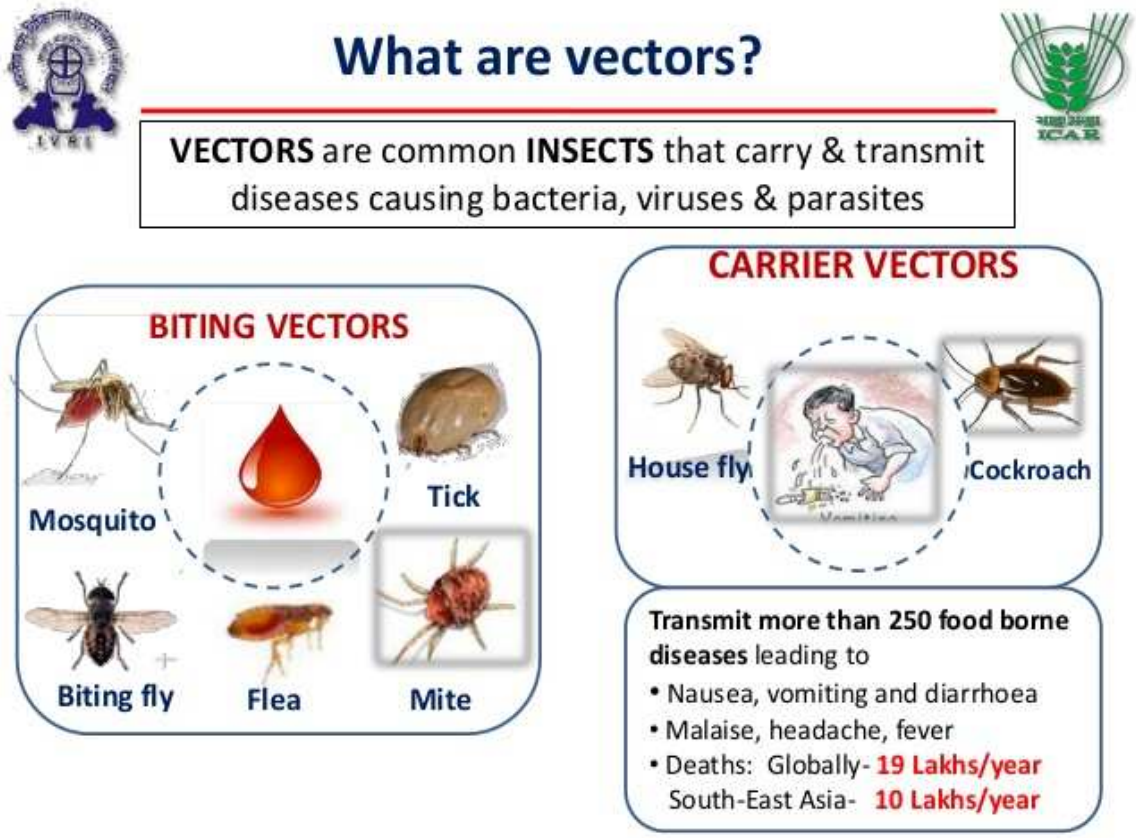
- Efficient monitoring, sufficient resources and rapid action.
- Establish quarantine and medical facilities supervised by trained medical care givers and doctors.

National Academia Input
Search & Rescue, Law Enforcement

- Establish hospital-based sentinel sites.

International Academia Input
Search & Rescue, Law Enforcement

- Provide treatment with antiviral and antibiotic medications and implementation of infection control measures.



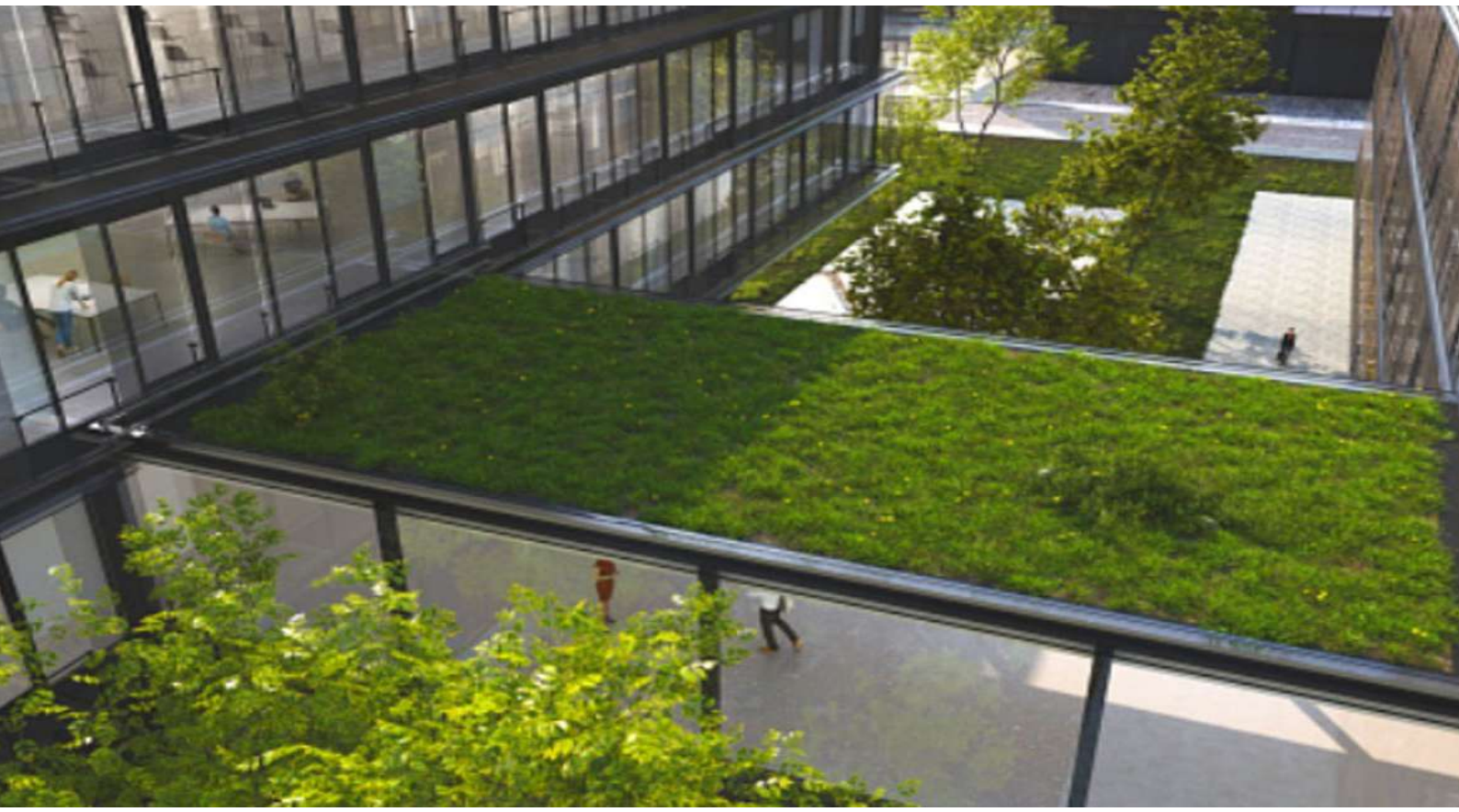
(g) Contingency – Communities Capacity Issues for Disasters Resilience

National Academia Input
Individual & Community Level

- Minimize the impacts of natural disasters through insurance programs.
- Promote community development through effective and culturally relevant education about risks.

International Academia Input
Individual & Community Level

- Communities should include green infrastructure into urban planning and development to take advantage of the various benefits that ecosystem services offer.
- Prioritize empowerment, social cohesion, and a shared sense of common good to enhance community functioning before, during, and after disasters.

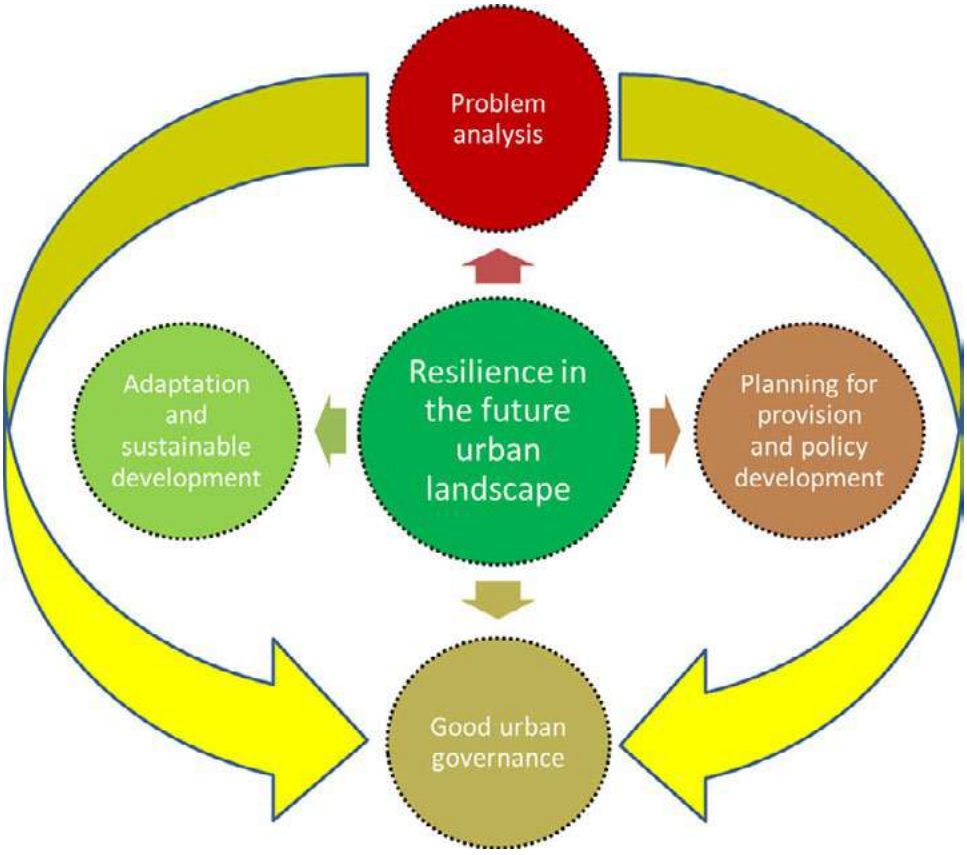


National Academia Input
Area Governance

- Provision of mobile healthcare services.

International Academia Input
Area Governance

- Integrate resilience principles into urban planning, building design, and transportation networks for better disaster and public health preparedness.



National Academia Input
Role of Federal Organizations

- Showcase outstanding partnerships that have resulted in excellent financial, social, and environmental outcomes for both enterprises and communities.
- Implement policies and activities that recognize the specific problems that rural communities face.
- Pakistan's government should encourage economic growth by investing in roads, public transportation, and power grids.
- Integrate Federal personnel (e.g., USACE, EPA, DOE, FEMA, etc.) into low-capacity communities for extended durations to aid in developing resilience and mitigation projects as part of their recovery planning.

International Academia Input
Role of Federal Organizations

- Implement proactive tactics and establish an enabling climate for partnership creation.
- Recognize the various demographics, customs, and communication preferences in rural regions.
- Launch pilot scale projects to encourage and support citizens' independence.
- Create a new political framework that aim to replace the previous emphasis on top-down instructions with a more adaptable endeavor.

National Academia Input
Private Sector and Local Industry Role

- Invest in health, hygiene, and sanitation that aims to enhance local awareness and response to health shocks.

International Academia Input
Private Sector and Local Industry Role

- Involve private sector that can facilitate sustainability by engaging market actors early in project design to comprehend incentives and boundaries on both sides.

National Academia Input
NGOs, Humanitarian Resource Enablers

- The Government and other stakeholders should supply basic gardening tools and equipment essential for planting, watering, and maintaining the kitchen garden.
- Collaborate closely with communities, the private sector, and local governments to contribute to shock proofing water systems and other natural resources, ensuring the well-being of vulnerable groups.
- Future investments must prioritize sustainability and provide recommendations for successfully allocating investments in resilient communities.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Customize the Kitchen Gardening Package to meet the individual needs, preferences, and socioeconomic conditions of target homes.
- Institutions should create a seismic assessment technique for hospitals.
- Encourage communities to accept responsibility for sustainability projects and actively engage in decision-making processes.

National Academia Input
Area Academia, Think Tanks

- Conduct capacity building programs for children and the elderly for the safety and well-being of vulnerable people during emergencies and catastrophes.
- Conduct research and create novel incentives to stimulate both public and private investment in adaptation and/or resilience measures.
- Promote Sustainable management of water and other natural resources.

International Academia Input
Area Academia, Think Tanks

- Conduct training programs that address the unique needs, abilities, and learning styles of youngsters and the elderly.
- Use age-appropriate teaching materials, visual aids, and interactive exercises to increase student involvement and comprehension.
- Adopt Community-Based Disaster Preparedness Plan (CBDP) to empower local residents to lead and take part in disaster risk reduction and management initiatives.
- Conduct trainings for hands-on experience and simulations of evacuation procedures in safe, controlled situations.

National Academia Input
Local Media and Early Warning Center

- Utilize social media and communication methods to spread the information.
- Prioritize expanding Early Warning Action Framework coverage to more communities, especially those in remote and underprivileged locations.

International Academia Input
Local Media and Early Warning Center

- Encourage coordination and information exchange between various early warning systems, such as meteorological agencies, disaster management authorities, and humanitarian organizations.
- Increase the crisis modifier's response capacity by investing in resource prepositioning, logistics support, and quick response methods.

National Academia Input
Search & Rescue, Law Enforcement

- Promote Humanitarian efforts to safeguard against impending dangers.
- Conduct in-depth assessments to better understand the impacted areas in sociocultural, geographical, and political contexts.

International Academia Input
Search & Rescue, Law Enforcement

- Identify existing vulnerabilities, community dynamics, and coping mechanisms.
- Use the community policy network to proactively detect and assess disaster risks at the local level.

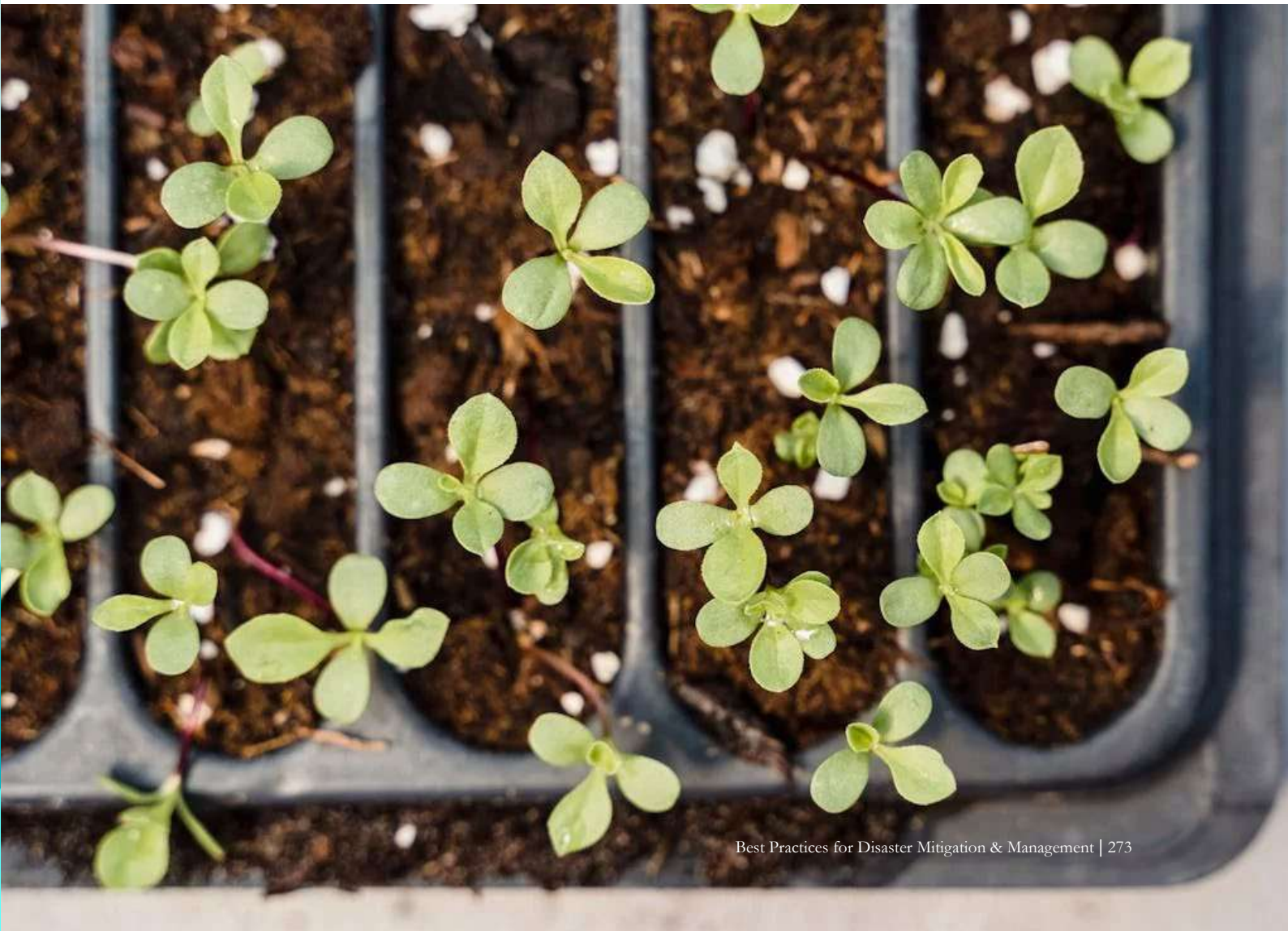
(h) Contingency – Food Security and Social Crises

National Academia Input
Individual & Community Level

- Focus on home garden and village plant nurseries.
- Grow either fodder for livestock or cereal crops for their food.
- Local donkeys should be revived as they are a source of power and can thrive very well on scant vegetation.

International Academia Input
Individual & Community Level

- Use seeds that are labeled as genetically pure and free from cross contamination.
- Use fresh and high germination rate seed.
- Promote sustainable food production practices, such as community gardens, farmers' markets, and cooperative farming initiatives.



National Academia Input
Area Governance

- The government should commission water interventions like rainwater harvesting (RWH) systems, emergency ponds, and small dams to provide safe drinking water.
- Pakistan must tackle food insecurity in both rural and urban areas through multi-sectoral interventions, focusing on enhancing production, processing, transportation, storage, and marketing.
- Pakistan needs to empower agriculture and livestock producers with better access to technology in the desert areas.

International Academia Input
Area Governance

- Develop a sustainable, healthy, safe and climate-neutral food system by conducting research on agriculture and retail trade, interaction between different stakeholders, regulation, and the steering power of policy makers (Finland).

National Academia Input
Role of Federal Organizations

- Cultivate drought resistant crops such as millet, sorghum, and wheat.
- Educate farmers on Climate Smart Agriculture (CSA) and give access to advanced technology.

International Academia Input
Role of Federal Organizations

- Enhancing diversification within the food system, such as integrating production systems, utilizing diverse genetic resources, and promoting varied diets.
- Cultivate drought resistant crops, such as sorghum, millet, and certain varieties of wheat and barley, that require less water.

National Academia Input
Private Sector and Local Industry Role

- Introduce small-scale, portable solar units to convert brackish water to sweet water can provide an alternative source of potable water and can help communities prevent diseases like stomach problems, which are a result of drinking brackish water.
- Make connections to metropolitan markets and invest in transportation infrastructure, to have better access to markets.

International Academia Input
Private Sector and Local Industry Role

- Promote small scale agriculture businesses.
- Launch projects related to development and non-profit initiatives empowering the rural community by capacity building and small and medium home-based industry.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Promote integrated multi-sectoral intervention (by increasing the availability of drinking water, boosting household income, and facilitating access to a nutritious diet) to tackle malnutrition.
- Large-scale vaccination and deworming campaigns to be organized.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Initiate silo projects (wheat, grains).
- Technology transfer, advisory services, and facilitation extension should be implemented and practiced in a dynamic way to achieve the set goals regarding sustainable agriculture.

National Academia Input
Area Academia, Think Tanks

- Empowerment of Women in Agriculture.
- Promoting local foods pomegranate, olive, zizyphus are among the fruit trees which could grow in desert and semi-desert conditions and could tolerate extreme drought conditions.
- Hydroponics and greenhouse farming should be promoted.
- Investment in bio salinity research.

International Academia Input
Area Academia, Think Tanks

- Use speed breeding techniques and selected Heliospectra ELIXIA LED growth lights to illuminate plant growth rooms.
- Implement straw checkerboard barriers for erosion control and plant recovery in vulnerable areas. These barriers effectively augment surface roughness, diminishing wind speed in the near-surface layer and contributing to the preservation of ecosystems.
- Promote Arid flora bombing (Seed bombing) in desert areas.
- Production of a variety of products such as candies, jam, wine, salads, and even burgers from cactus.

National Academia Input
Local Media and Early Warning Center

- Create the awareness about the sustainable as well as conservation agricultural techniques (land preparation, cultural, protection, post harvesting, value addition and marketing facilities).

International Academia Input
Local Media and Early Warning Center

- Provide vital emergency and resilience aid to affected people with a focus on bolstering crop production and assist individuals with inputs and technical guidance.

National Academia Input
Search & Rescue, Law Enforcement

- Support smallholder farmers via market connections, technical help, and loan availability.

International Academia Input
Search & Rescue, Law Enforcement

- Free and reliable distribution of emergency food, nutrition, and livelihood support.

(i) Contingency – Tourism Related Crises

National Academia Input
Individual & Community Level

- Tourists should familiarize themselves with potential risks and hazards unique to desert environments, such as extreme temperatures, sandstorms, and limited access to resources.
- Prioritize personal safety, stay hydrated, seek shelter during sandstorms, protect from sun, and adhere to local guidelines and regulations.
- Utilize navigation tools like maps, GPS devices, or compasses to navigate through desert terrain, thereby minimizing the risk of getting lost.

International Academia Input
Individual & Community Level

- Obtain basic first aid when traveling in remote desert areas.
- Acquire fundamental survival skills, including building shelters, locating water sources, and signaling for help.
- Tourists should ensure their safety by carrying reliable communication devices, allowing them to call for help during emergencies or communicate their location to rescue teams.

National Academia Input
Area Governance

- Promote tourism policy which respects sustainable development and a moral and professional code of ethics.
- Educate people about tourism challenges.

International Academia Input
Area Governance

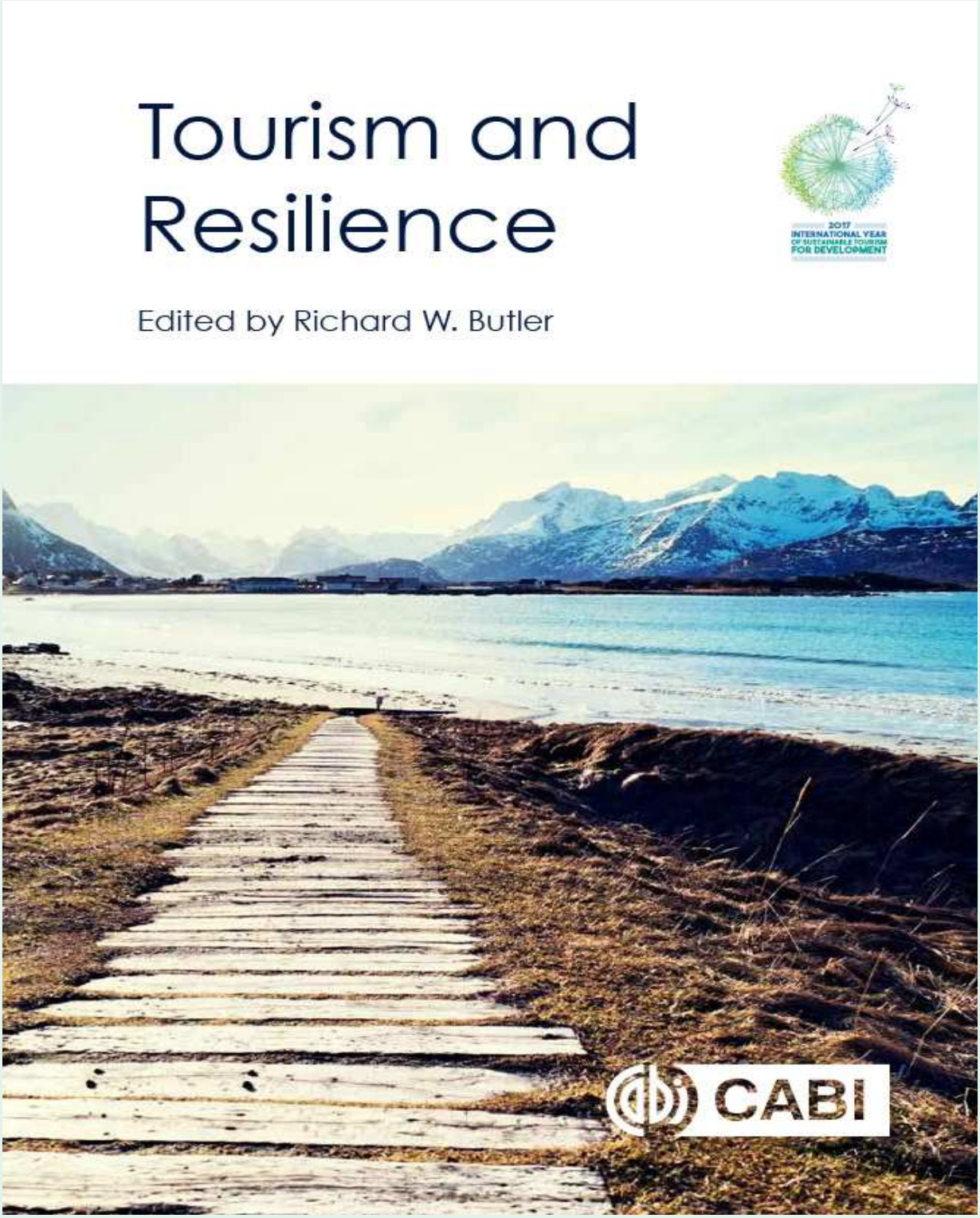
- Provide adequate facilities for tourists (water, shelter, transportation).

National Academia Input
Role of Federal Organizations

- Establish a comprehensive framework that outlines protocols for effectively respond to various crises.
- Provide special short-term loans or running finance options to meet immediate financial needs

International Academia Input
Role of Federal Organizations

- Commit funds to enhance infrastructure development and ensure ongoing maintenance.
- Introduce innovative financial support packages specifically for the tourism sector to bolster its resilience and recovery.

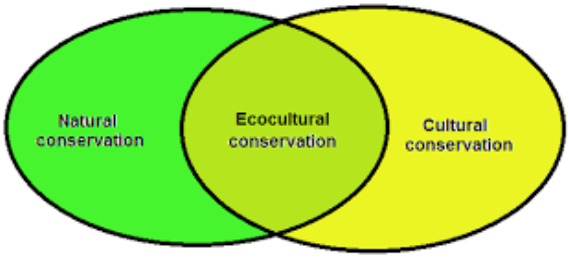


National Academia Input
Private Sector and Local Industry Role

- Implement versatile business models capable of swift adaptation to evolving market conditions and crises.
- Incorporate flexible booking policies, alternative accommodation options, and virtual experiences to enhance resilience.

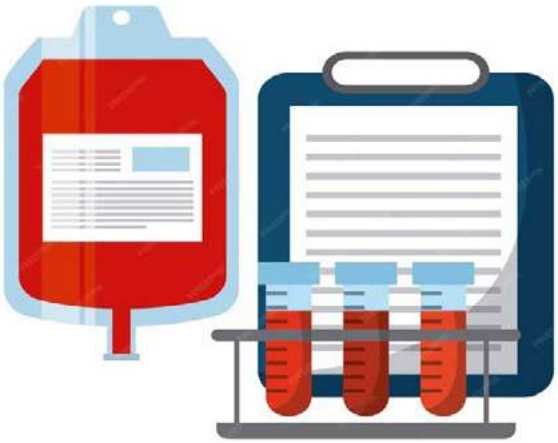
International Academia Input
Private Sector and Local Industry Role

- Create a variety of resilient tourism products and experiences, including c, and adventure tourism, to mitigate the impact of downturns in specific sectors during crises.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Strategically pre-position emergency supplies, medical kits, and communication equipment within desert zones.
- Organize inhouse and online trainings/ webinars for tour operators, and workers.



International Academia Input
NGOs, Humanitarian Resource Enablers

- NGOs should conduct training programs for their staff and local communities, covering emergency response procedures, first aid, emergency communication, and cultural sensitivity.
- Provide funds to equip search and rescue teams with advanced technology, including drones, thermal imaging cameras, and GPS devices.

National Academia Input
Area Academia, Think Tanks

- Use satellite imagery and GPS technology to aid tourists.

International Academia Input
Area Academia, Think Tanks

- Collaborate internationally with academia and think tanks to build a collective understanding and response to tourism-related crises worldwide.
- Utilize research findings to provide advisory input that informs global policies, thereby enhancing the efficacy of crisis responses within the tourism industry.

National Academia Input
Local Media and Early Warning Center

- Local media outlets should establish communication channels with tourism stakeholders, government agencies, and emergency responders to facilitate the exchange of information and coordinate response efforts during an emergency.
- Alerts should be offered in multiple languages.

International Academia Input
Local Media and Early Warning Center

- Provide easily accessible contact details for emergency services, tourist assistance hotlines, and pertinent government agencies ensures tourists can swiftly seek help during emergencies.
- Development of applications should be considered in multiple languages.

National Academia Input
Search & Rescue, Law Enforcement

- Creating Joint task forces.
- Provide emergency shelter and refuge, as well as evacuation transportation by land, sea, or air.

International Academia Input
Search & Rescue, Law Enforcement

- Establishing a central command center and Surveillance systems.
- Provide relief supplies that are genuinely suitable for local needs, cultures, and customs, and whenever feasible, procured from local sources.

CHAPTER

5

Coastal Zone

Sindh and Balochistan

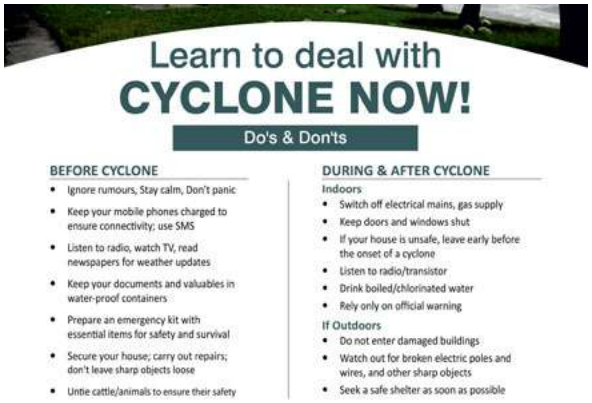
(a) Contingency – Cyclones

National Academia Input
Individual & Community Level

- Keep yourself updated with weather forecasts and warnings issued by meteorological departments. Follow official instructions and evacuation orders.
- Stay indoors and away from windows, doors, and exterior walls.
- Trim trees and shrubs around your home so that they are more wind resistant.

International Academia Input
Individual & Community Level

- Before a cyclone hits, move and transfer belongings to safer places, prepare emergency kits and stockpiled food.
- During a cyclone, stay indoors and away from windows, doors, and exterior walls. Seek shelter in a basement if possible.
- Get involved in community preparedness efforts such as neighborhood watch programs, disaster response training, and volunteer organizations.

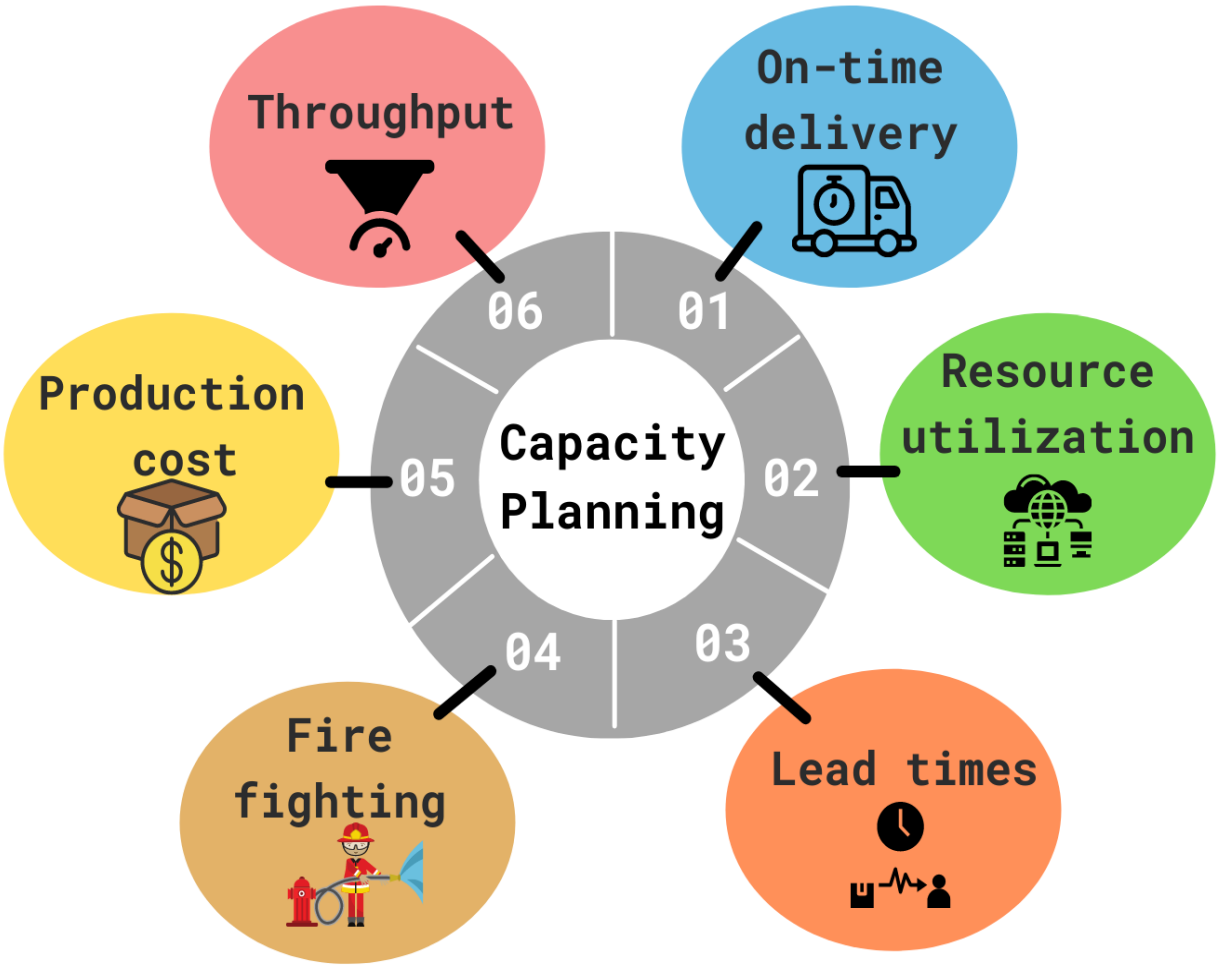


National Academia Input
Area Governance

- Improve overall disaster preparedness, response, recovery, and mitigation by Strengthening management capacity and coordination as well as networking facilities at all levels.
- Launch public awareness campaigns to educate residents about cyclone preparedness, evacuation procedures, and the importance of heeding warnings.

International Academia Input
Area Governance

- Establish Cyclone Preparedness Plan, construction of emergency shelters, the dissemination of warnings, and improvements in the accuracy of cyclone forecasts will play a part in increasing resilience.
- Enforce building codes to ensure the structures are built to withstand cyclones and storm surge.

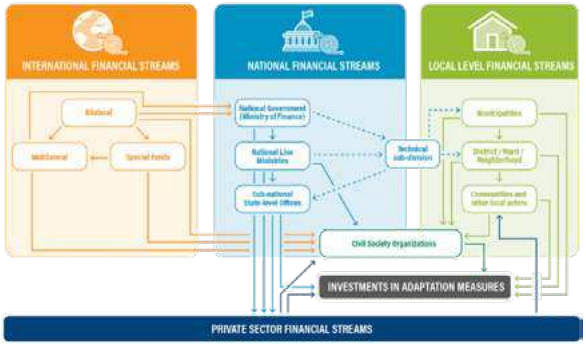


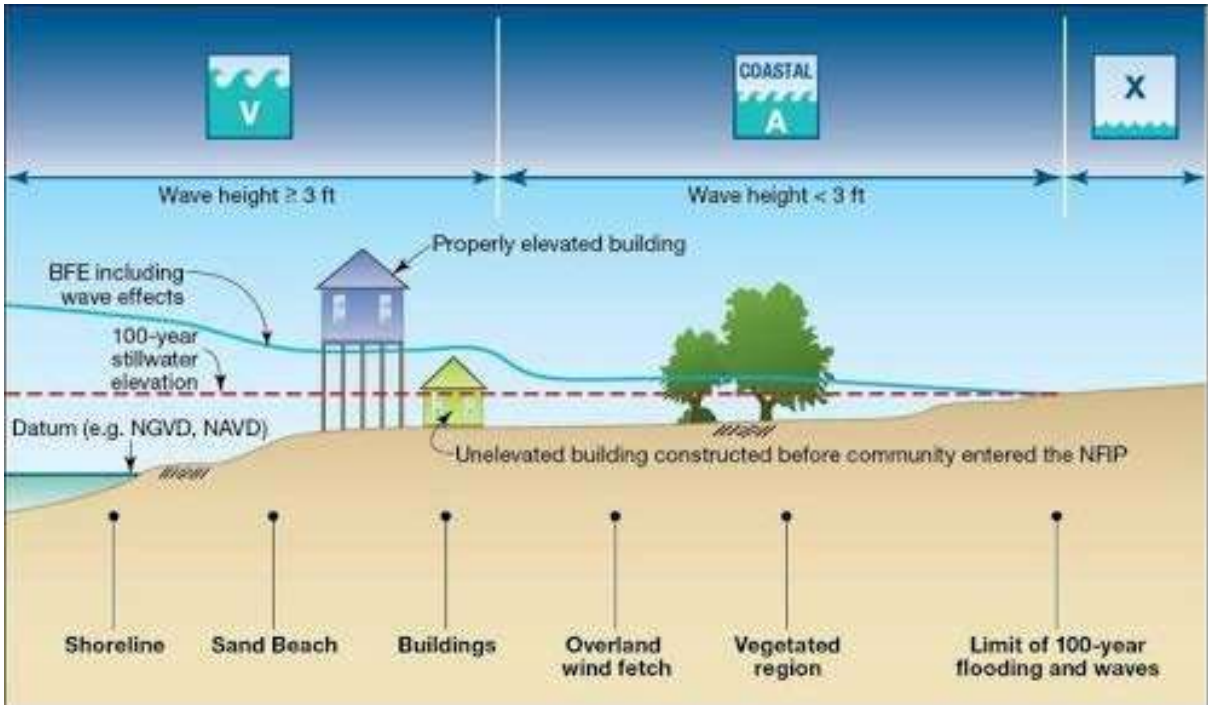
National Academia Input
Role of Federal Organizations

- Undertake risk assessments to evaluate the risks of tropical cyclones and illustrate them in hazard maps.
- Invest in climate adaptation by scaling up and deploying public funds more effectively.
- Adopt a holistic approach that encompasses all aspects of risk management, that addresses the issue of community vulnerability.

International Academia Input
Role of Federal Organizations

- Implement and regulate land use and enforce building codes for areas vulnerable to the effects of tropical cyclones.
- Allocate resources for research and development initiatives aimed at improving cyclone forecasting, risk assessment, and disaster management strategies.





National Academia Input
Private Sector and Local Industry Role

- Engage with government agencies to develop and implement disaster risk reduction and climate resilience programs.
- Use locally available materials like mud, sand, and bamboo combined with modern engineering techniques to create more resilient infrastructure and barriers.

International Academia Input
Private Sector and Local Industry Role

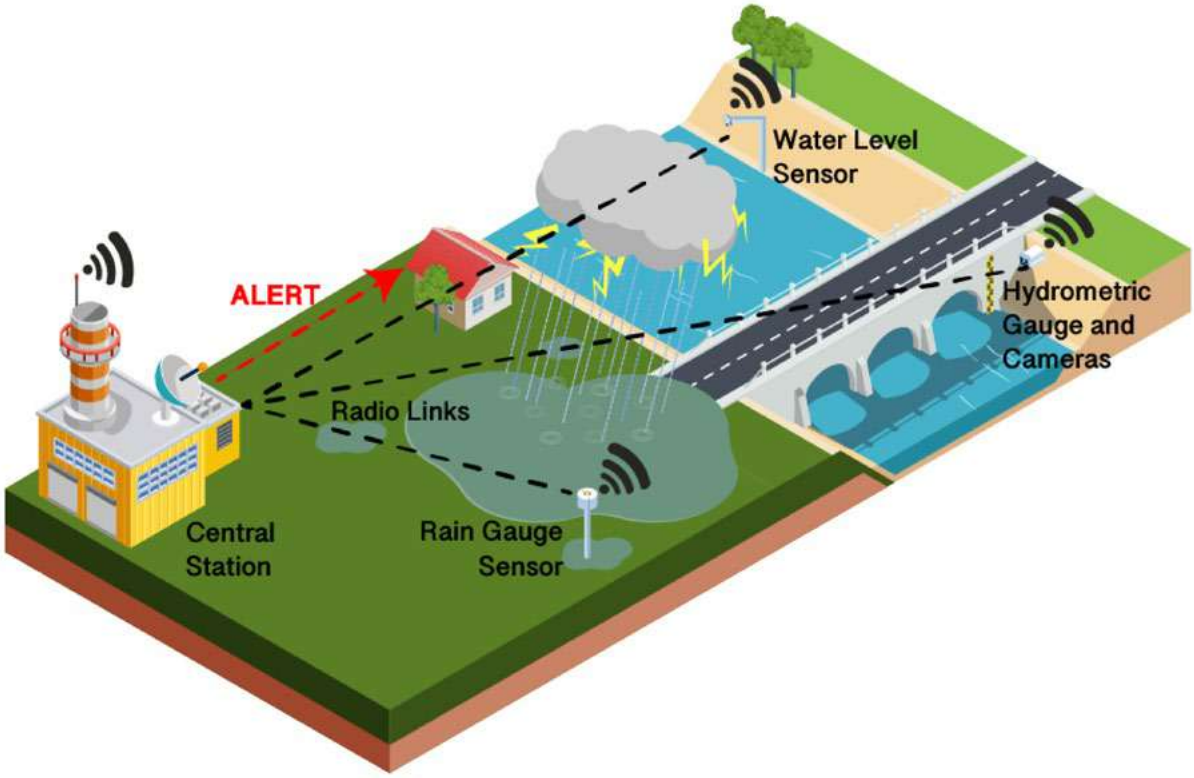
- Work on early warning systems that can accurately predict cyclones and issue timely alerts to residents.
- Build robust coastal infrastructure, such as seawalls, breakwaters, and surge barriers, to guard against storm surges.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Engage with local communities to raise awareness about cyclone risks, preparedness measures, and evacuation procedures.
- Improve early warning systems coupled with meteorological sensors to disseminate timely information to affected communities.
- Equip local authorities, and communities with skills necessary to anticipate, prepare and respond to cyclones.
- Identify and designate suitable emergency shelters in coastal areas capable of accommodating large numbers of residents during cyclone events.

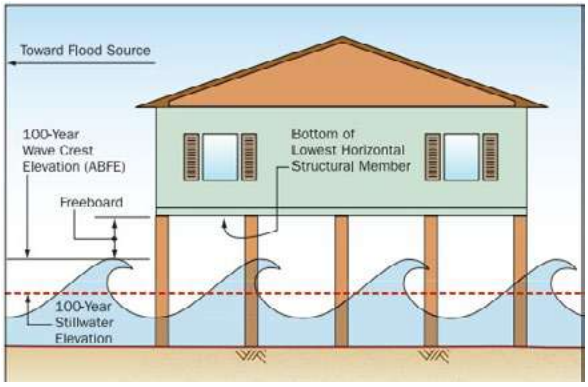
International Academia Input
NGOs, Humanitarian Resource Enablers

- Enhance the capacity of local organizations and governments to respond effectively to cyclones by Providing training, resources, and technical support.
- Support the evidence-based policymaking and advocating for improved disaster risk reduction strategies.
- Promote environmental conservation and sustainable resource management in coastal areas.



National Academia Input
Area Academia, Think Tanks

- Use of nature-based solutions, or green infrastructure.
- Enact building codes for areas vulnerable to tropical cyclones.
- Develop a comprehensive floodplain management plan.
- Build embankments, sluice gates, polders and beach nourishment.
- Use of satellite and Drone technology fused with early warning systems for floods, integrate data from satellite imagery, weather radars, hydrological sensors, and use of predictive modeling tools.



International Academia Input
Area Academia, Think Tanks

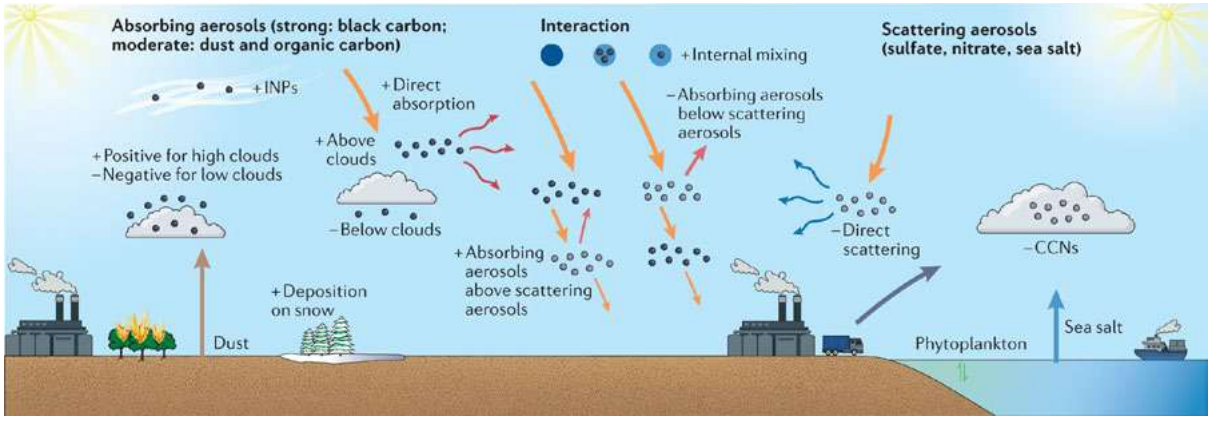
- Use Nonstructural mechanisms to mitigate coastal flooding.
- Integration of "green" infrastructure (mangroves) with traditional "gray" infrastructure to provide cost effective protection from cyclones
- Spread hygroscopic particles into the atmosphere to enhance rainfall and energy release could help to weaken cyclones.

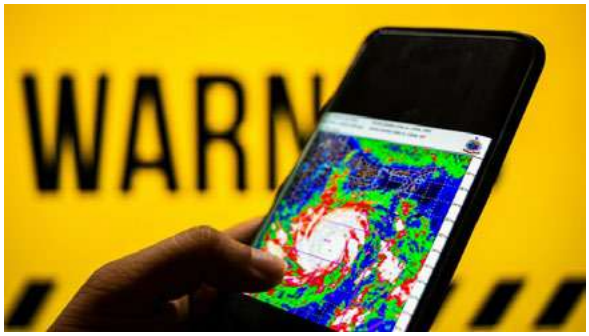
National Academia Input
Local Media and Early Warning Center

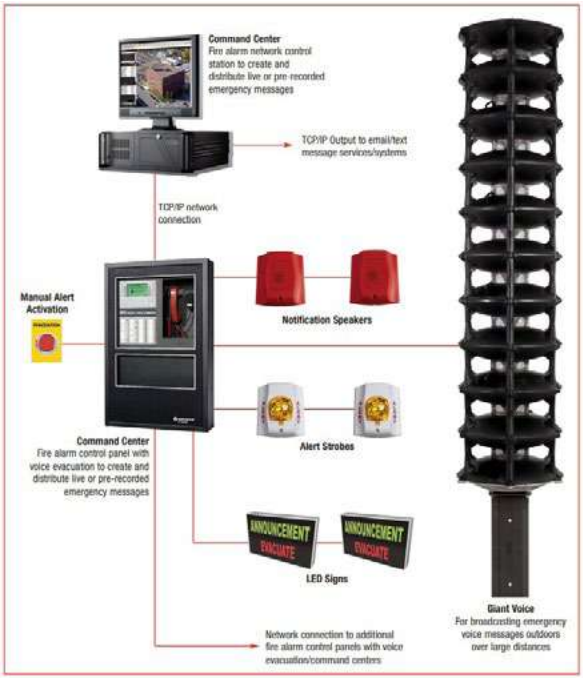
- The volume (loudness) required for alerts and the number of sirens needed in a particular area and their effective positioning should be kept in mind while installing early warning systems.
- Radio wireless links with a good line of sight to such systems are used for such purposes. HF/VHF networks used by government agencies or emergency services are currently available.
- Mass notification systems activated via satellite and addressable notification systems can be used for rough terrains (In coastal regions of Pakistan like in Gwadar and Pasni)
- Use of local media and weather forecast apps to disseminate the early warnings across the region.

International Academia Input
Local Media and Early Warning Center

- The best solution for Best early warning systems would be a wireless-operated mass notification system.
- Broadcasters should be trained how to communicate early warnings so that panic can be avoided.
- Advancement in the technologies of remote sensing through satellites which can predict and give warning signs to the government and people who are going to hit their locality.
- Use of Cloud Computing, data sharing, creating and using mobile apps and utilizing social media channels to communicate with communities.







National Academia Input
Search & Rescue, Law Enforcement

- Monitor weather conditions and issue timely warnings to coastal areas.
- Prevent looting and other criminal activities in evacuated or disaster-affected areas.
- Conduct evacuation plans, ensuring the safe movement of people from vulnerable areas to shelters.

International Academia Input
Search & Rescue, Law Enforcement

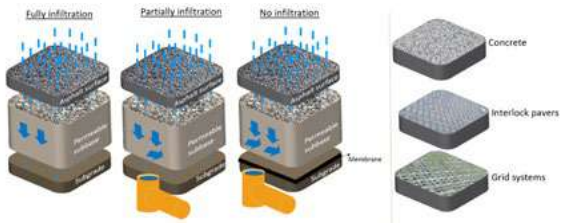
- Conduct quick water rescues and aid trapped people in flood affected areas.
- Work closely with other emergency response agencies, such as the Coast Guard, police, and fire departments, to coordinate rescue efforts.
- Establish a land use management system that disseminates knowledge on land use along the coastal belt and discourages further settlement in remote locations (Land Encroachments) that cannot be easily accessed, especially in emergencies.

(b) Contingency – Rising Temperatures, Abnormal Heat

National Academia Input
Individual & Community Level

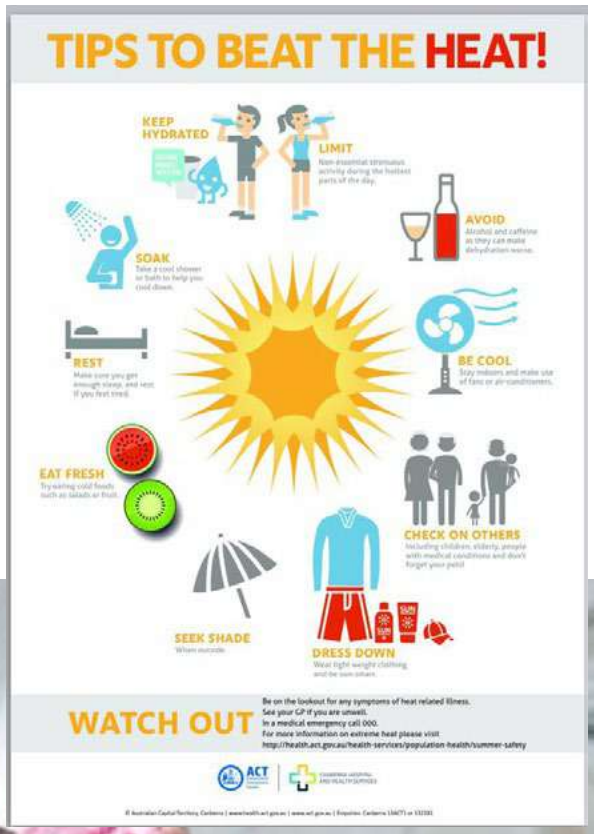
- Staying hydrated and indoors during the hottest part of the day, and checking on vulnerable individuals like the elderly or those with health conditions.
- Support and revive traditional techniques like;

  a. Wearing loose clothing
  b. Natural ventilation in homes
  c. Staying hydrated



International Academia Input
Individual & Community Level

- Usage of permeable materials in civil infrastructure and residential construction can reduce the heat effect.
- Disseminate timely early warnings by bicycle, megaphones and sirens, signal lights, signal flags.

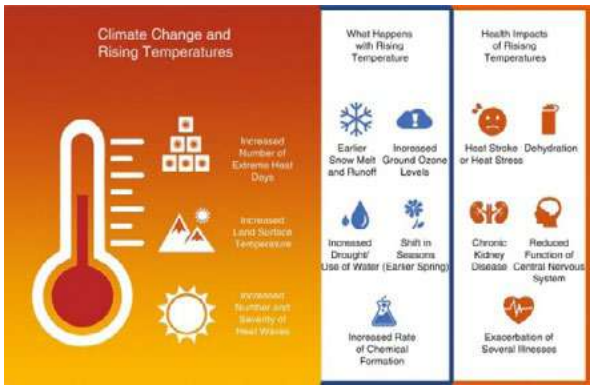


National Academia Input
Area Governance

- Build Natural landscapes in coastal and urban areas, such as trees, parks, and vegetation which can help in cooling.
- Invest in the construction and maintenance of coastal defense infrastructure such as seawalls, levees, and dikes to protect coastal communities from storm surge and erosion.
- Conduct regular assessments of existing coastal defenses and prioritize upgrades where needed.

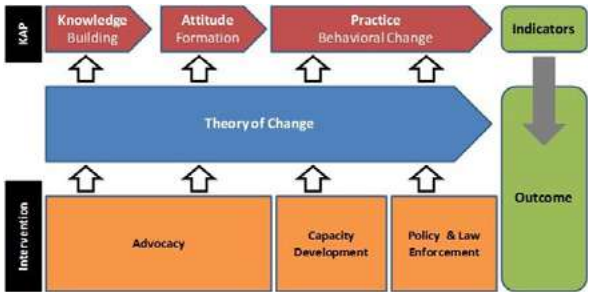
International Academia Input
Area Governance

- Build the capacity of local emergency responders and healthcare professionals to effectively manage heat-related emergencies through training.
- Integrate cyclone risk management into broader climate adaptation and resilience planning initiatives.



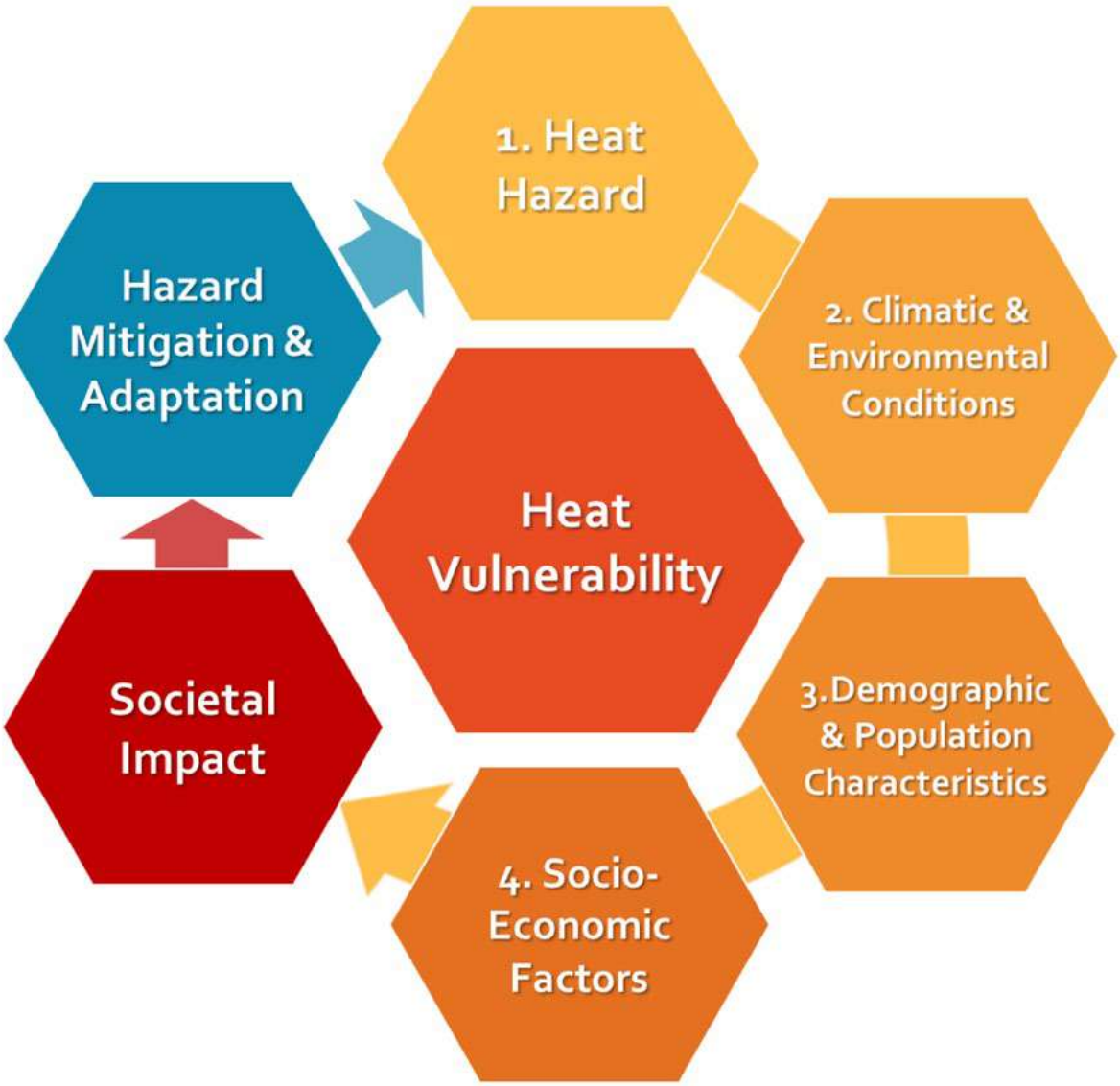
National Academia Input
Role of Federal Organizations

- Promoting the use of renewable energy sources such as solar and wind energy for cooling and electricity needs.
- Provide guidelines and resources for healthcare professionals to manage and treat heat-related health issues.



International Academia Input
Role of Federal Organizations

- Knowledge, Attitude and Practice (KAP) surveys on cyclone warning and heat waves in coastal regions should be initiated on a systematic basis in every tropical cyclone prone country.
- Promoting the use of green roofs and cool roofs in buildings, increasing ventilation, and setting up green spaces.



National Academia Input
Private Sector and Local Industry Role

- Conduct Social impact study on a periodic basis with a joint team of plantation experts, disaster managers and social scientists in every heatwave society.
- Build heat-resilient infrastructure and adopt urban planning practices which include the use of cool roofs, green spaces, and reflective surfaces to reduce the urban heat island effect.

International Academia Input
Private Sector and Local Industry Role

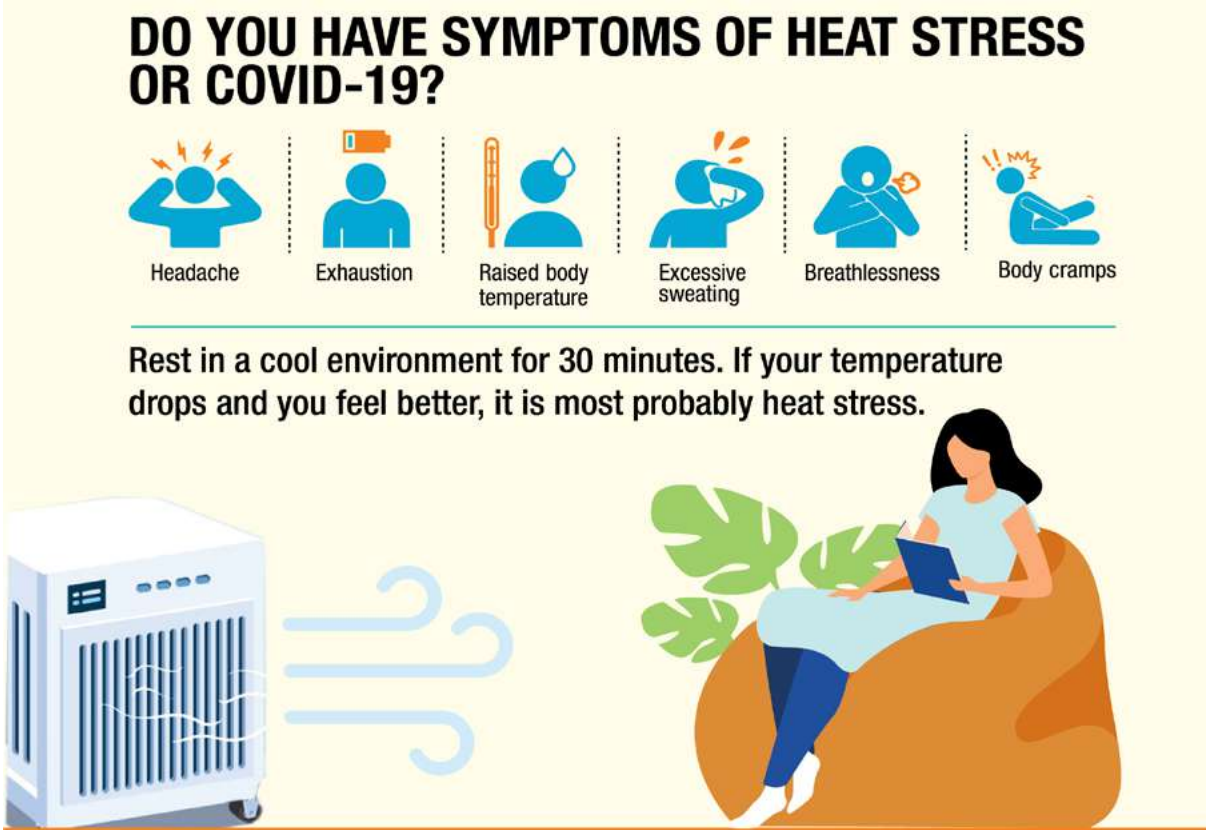
- Meteorological departments should give attention to special needs of specific occupational categories for Heat wave warning due to more vulnerability.
- Nonstructural mitigation measures should be made an integral part of developmental planning in cyclone prone and heat waves affected countries and mainstream it in every organization of the government as well as in the budgetary process.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Implement public health programs that raise awareness about the risks of heat-related illnesses and promote preventive measures.
- Project planning, design, and construction practices should account for intense heat in coastal areas.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Special policies, mediums and mechanisms should be evolved to remove gender and age bias in existing disaster preparedness activities.
- Educate the community about the risks of heat waves that can help people to take preventive actions and stay safe during these events.

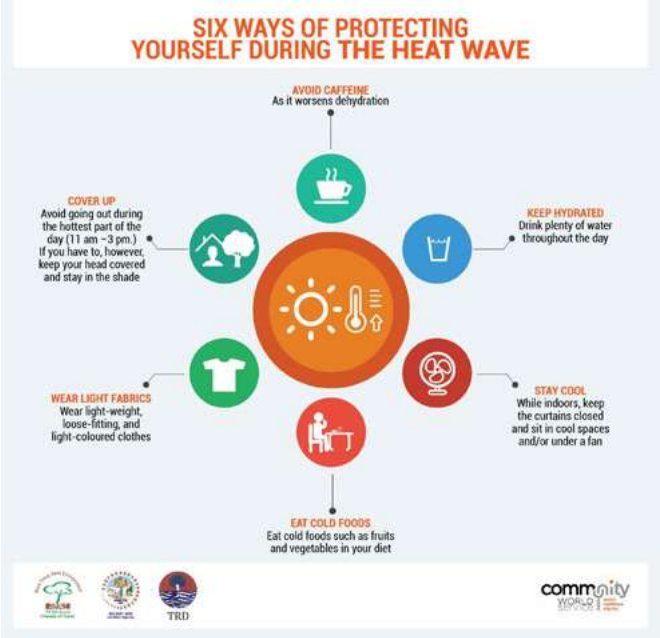


National Academia Input
Area Academia, Think Tanks

- Apply cool roofing solutions like reflective coatings to minimize heat absorption by buildings
- Build Healthy wetlands which have a tendency to absorb heat, filter pollutants, and provide valuable habitat for diverse species.

International Academia Input
Area Academia, Think Tanks

- Promote Green spaces or buildings that provide shade, reduces the urban heat island effect.
- Restoration of mangroves buffer coastlines, provide shade, and help regulate coastal temperatures.



National Academia Input
Local Media and Early Warning Center

- Build a community based early warning system for heatwaves, informing communities about predicted severity and precautionary measures.
- Warning signals in the form of flags or similar symbols which are culturally acceptable to the community should be adopted for easy dissemination of warning signals in societies with low literacy level and with limited communication infra-structure.

International Academia Input
Local Media and Early Warning Center

- Increasing tree plantings around the buildings to shade parking and along public rights-of-way.
- The warning message content should contain optimum information on heat wave hit areas to minimize the loss of lives.

National Academia Input
Search & Rescue, Law Enforcement

- Mobile civil and military medical teams should be constituted to work against epidemic outbreak and pre-positioning of contingency stocks to ensure swift response and relief efforts
- Prepare inventory of resources that are available for relief, rescue and evacuation.
- Assist communities in evacuation, and rescue the trapped groups and individuals during disasters.

International Academia Input
Search & Rescue, Law Enforcement

- Promote compliance and enforcement of local building laws requiring prescribed standards under national building codes in hazard-prone urban areas.
- Create the necessary legislation and rules to guarantee that survivors of disasters receive aid and recovery packages.
- Ensure the state of human rights in the impacted areas and respond to abuses of survivors' rights, such as denial of assistance, seizure of property, abduction of women or children, and injury to the elderly.

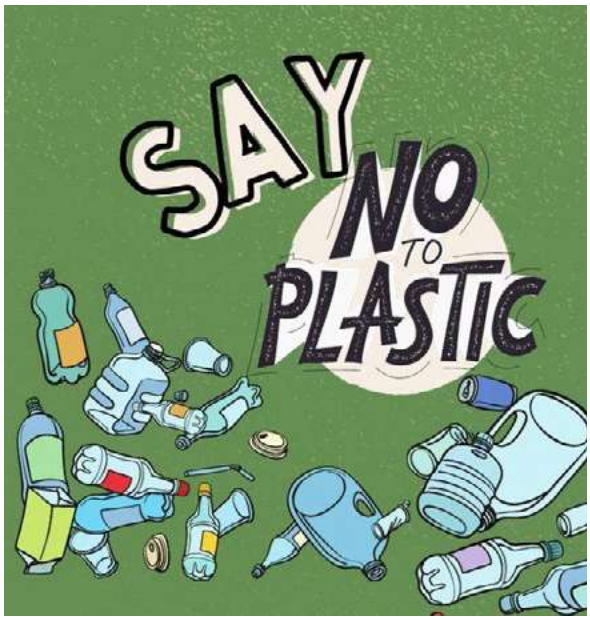
(c) Contingency – Marine Pollution, Sea Acidification

National Academia Input
Individual & Community Level

- Pakistanis should take responsibility at the individual level and play a part by not throwing away waste at the coast and into the sea.
- Start the plastic source reduction conversation in your community.

International Academia Input
Individual & Community Level

- Develop several volunteer campaigns programs for clean-up activity at the beach.
- Train Community about the method of fishing.

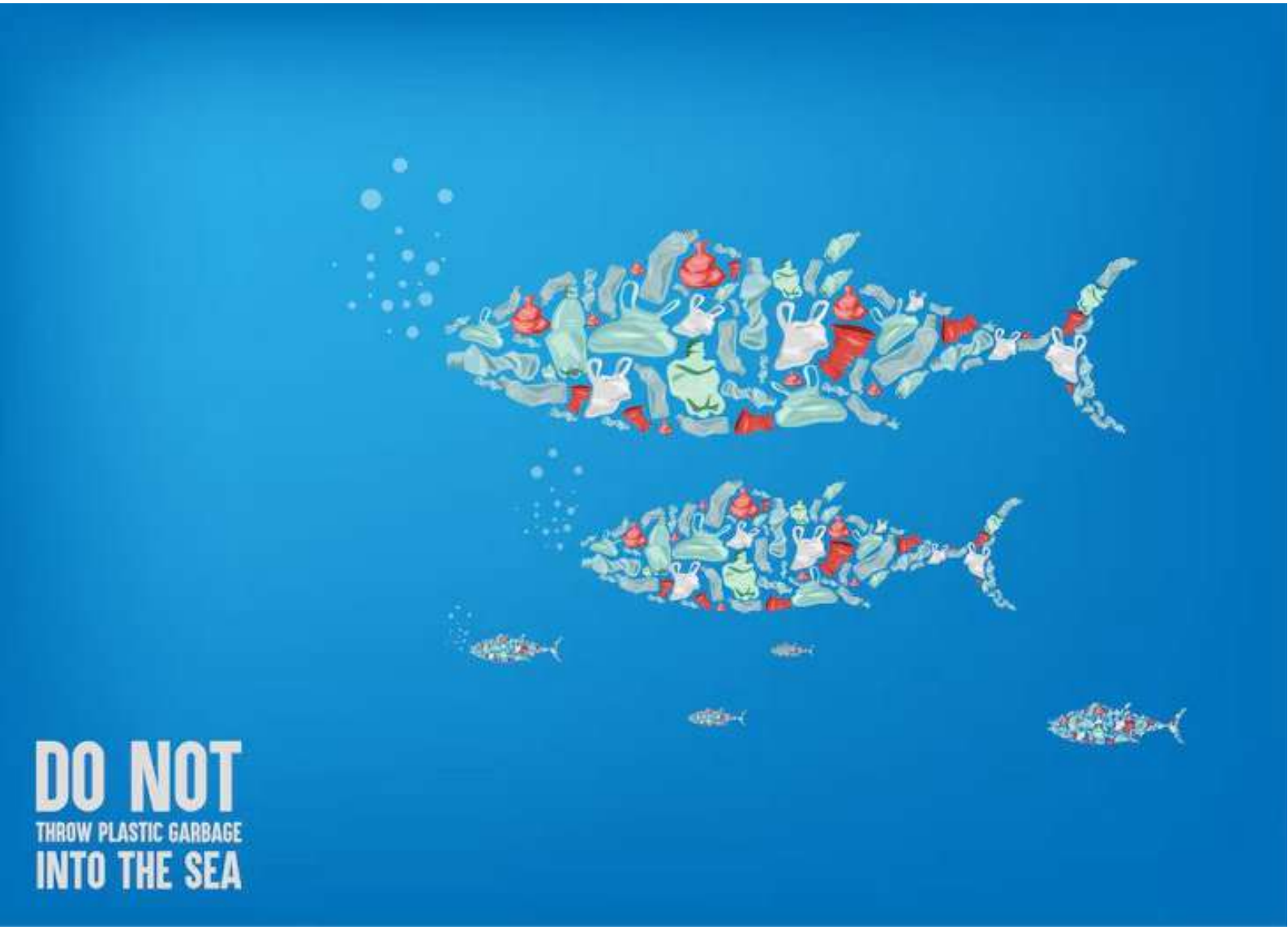


National Academia Input
Area Governance

- The dumping of hazardous waste can be checked by the authorities and businesses convinced to have treatment plants that measure up to international standards.
- Reducing reliance on fossil fuels, increasing energy efficiency, transitioning to renewable energy sources, and by protecting and restoring marine ecosystems that can reduce marine pollution and sea acidification.

International Academia Input
Area Governance

- Promote Eco-tourism activities about the wonders of marine ecosystems whilst also promoting a stable economy that relies on the ocean in developing countries.
- Practice safe boating far from mangroves, coral reefs and sea grasses.



National Academia Input
Role of Federal Organizations

- The government should encourage the construction of treatment plants and punish non-abiding industries with heavy penalties.
- The government should encourage the environmentally friendly industries through subsidies and other incentives.

International Academia Input
Role of Federal Organizations

- Implement the model of Monaco "The Responsible Trading scheme". which highlights eco-friendly practices employed by traders and supports them as they move towards a more sustainable approach to consumption.
- Following actions can prevent sea from marine pollution:

  a. Ban use of plastic and adopt litter control policies
  b. Diminish discharge of untreated sewage
  c. Establish partnerships to address marine pollution

National Academia Input

Private Sector and Local Industry Role

- By adopting cleaner production methods, installing waste treatment plants and by preventing spills in the sea can reduce the marine pollution and acidification.
- Support research and development to develop innovative technologies and solutions for addressing marine pollution and sea acidification.

International Academia Input

Private Sector and Local Industry Role

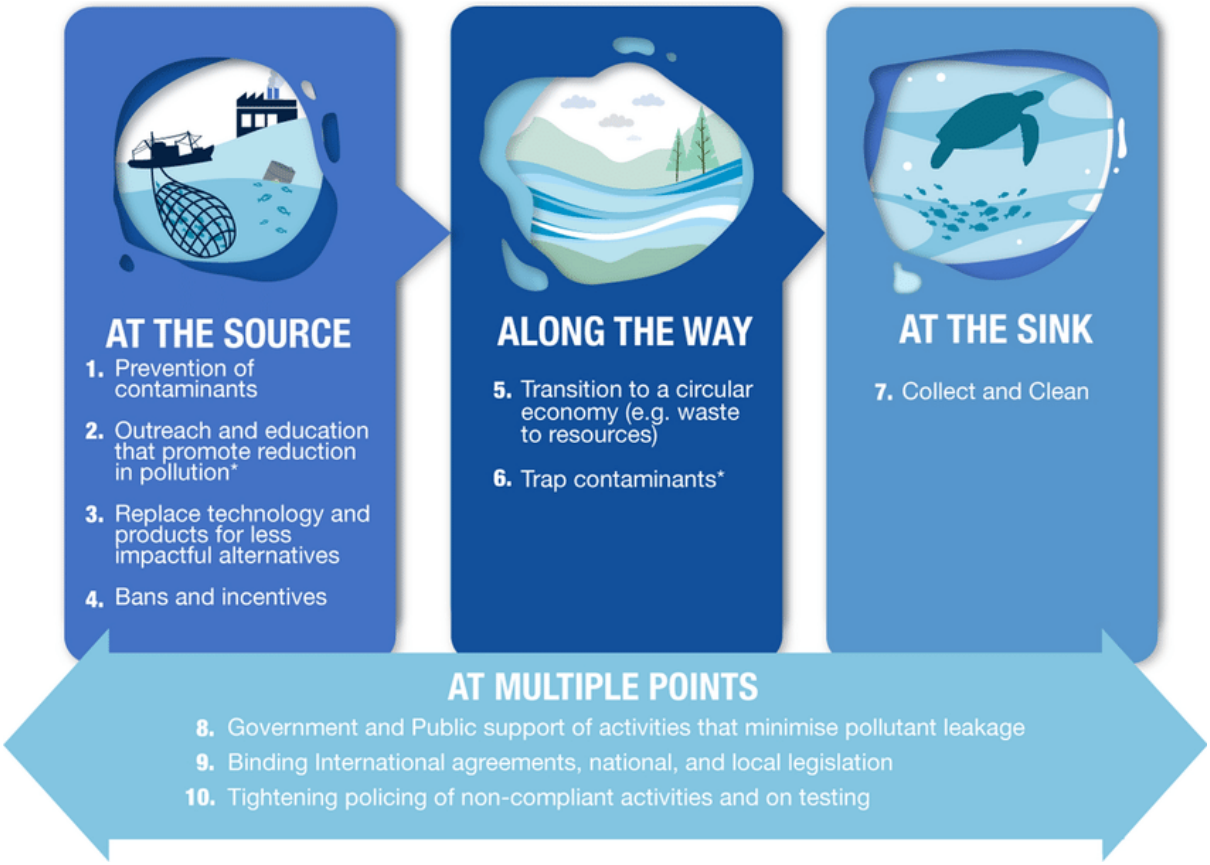
- Develops and promotes technology solutions for waste management and resource optimization.
- Implement sustainable practices to minimize pollution and reduce their environmental footprint.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Advocate for clean water policies and combats pollution from industrial sources.
- Support technological advancements in production, storage and marketing of agriculture, fisheries and livestock products
- Organize clean-up efforts to remove marine debris and pollutants from coastal areas and marine habitats.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Support Campaigns on global platforms against plastic pollution, illegal fishing, and unsustainable ocean practices like Green Peace campaign.
- Advocate for the adoption of biodegradable materials, circular economy principles, and responsible waste management practices.
- Sponsor the initiatives that can help people to adopt sustainable practices and responsible waste management. Moreover, support restoration projects to rehabilitate damaged ecosystems and promote biodiversity.

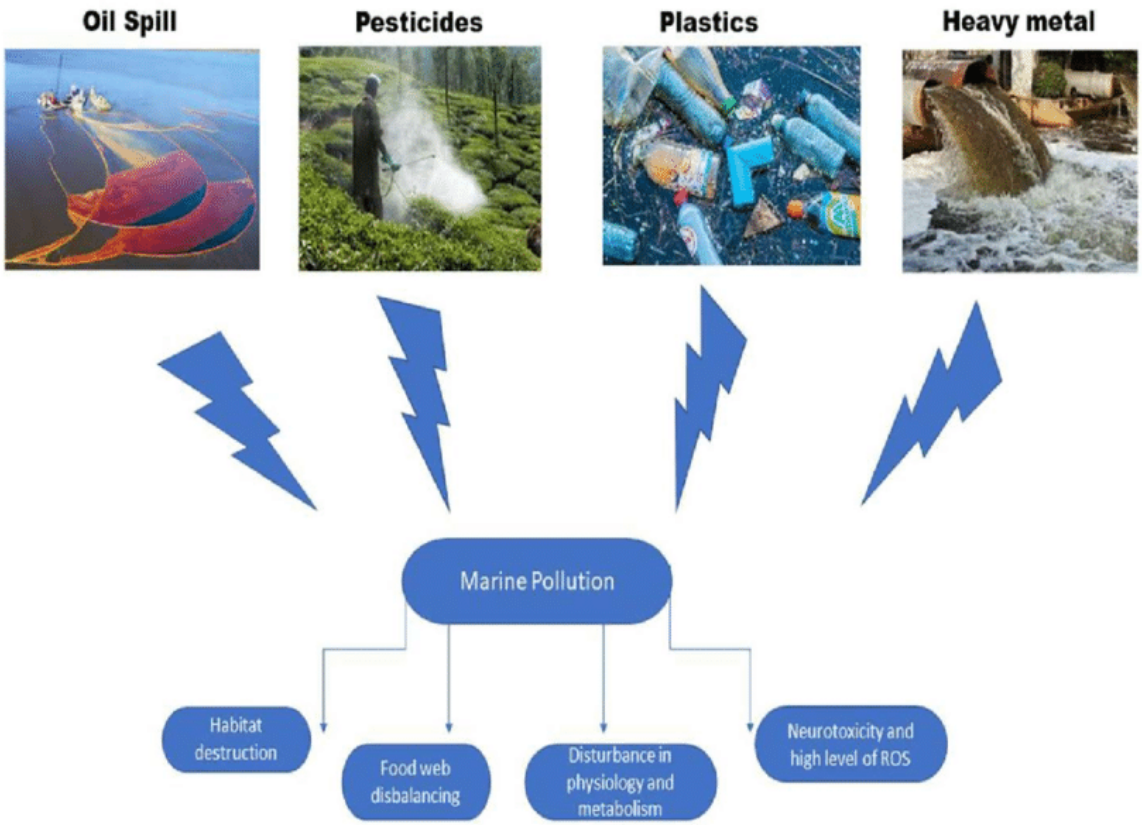


National Academia Input
Area Academia, Think Tanks

- Understand the key pollutants, identify pollution hotspots, and their impacts on marine biodiversity, fisheries, and human health.
- Promote restoration of mangroves buffer on coastlines which provide shade, and help to regulate coastal temperatures.

International Academia Input
Area Academia, Think Tanks

- Adopt Marine pollution control methods to coastal and marine resources.
- The implementation of maritime/marine spatial planning (MSP) strategies and management actions will help us to understand maritime pollution.

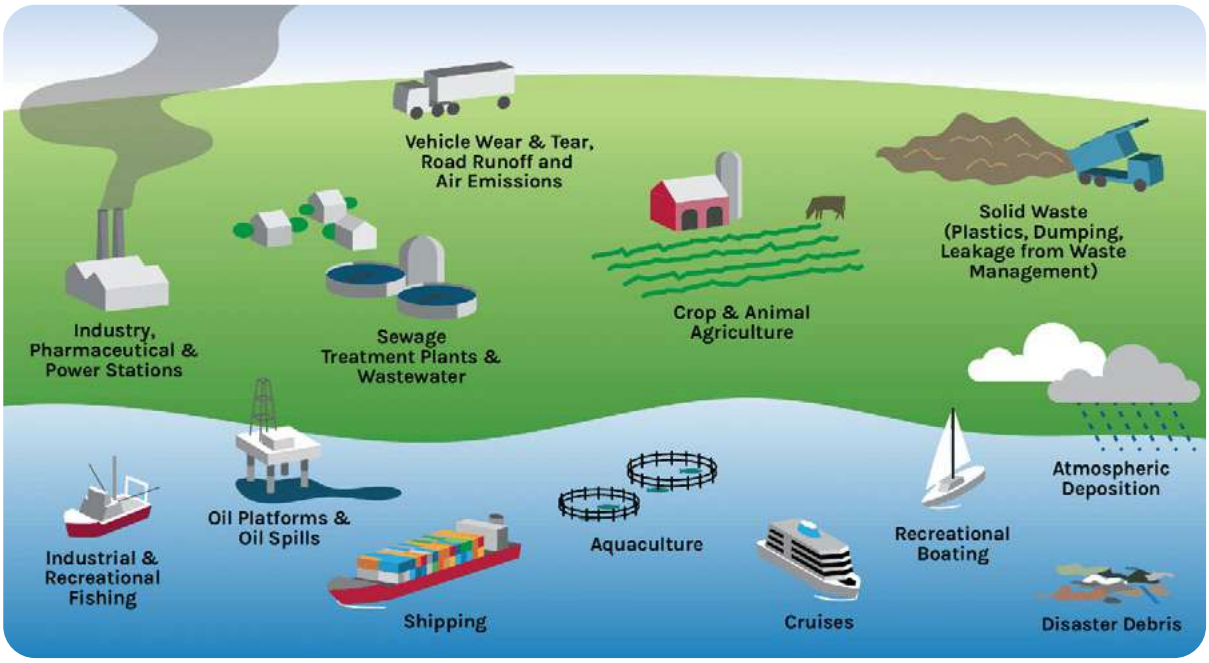


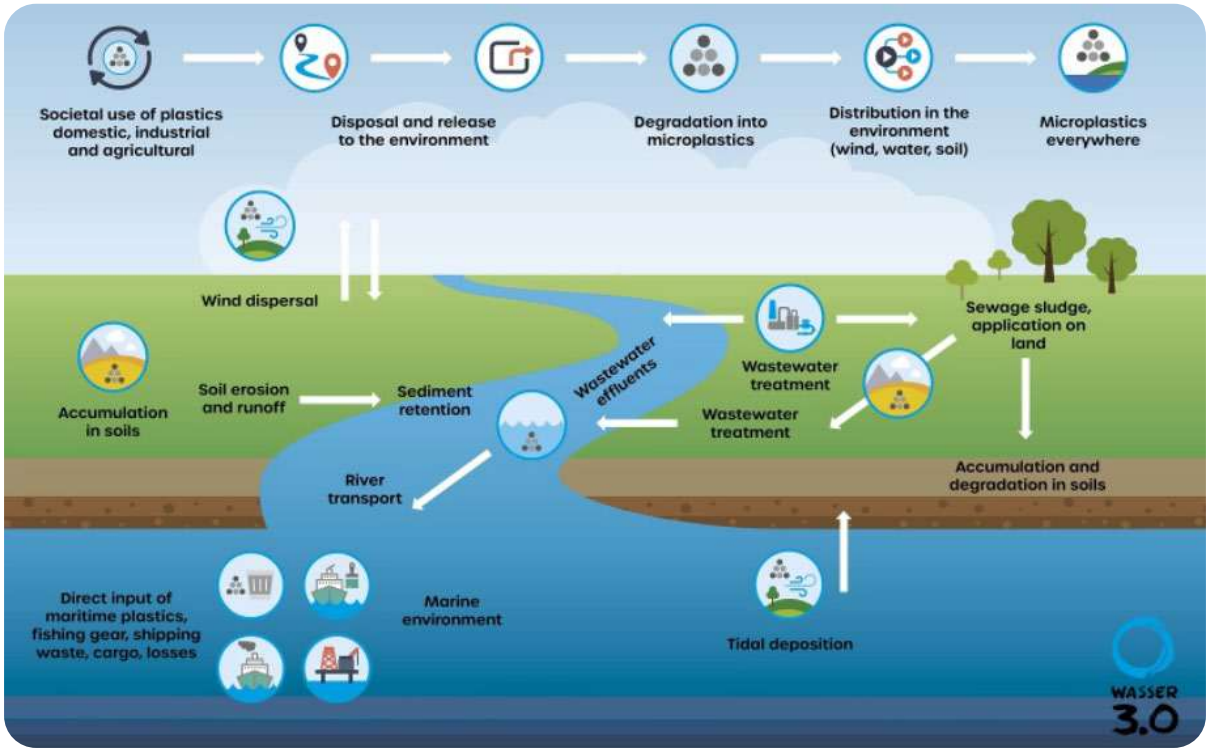
National Academia Input
Local Media and Early Warning Center

- Local media can help us in sensitizing the public on sea acidification.
- Promote preventive measures to reduce pollution and acidification.

International Academia Input
Local Media and Early Warning Center

- Through media, enhancing consumers' knowledge and capacity to make better decisions regarding their day-to-day waste production is critical to reduce marine pollution and incentivize such practices.
- Monitor water quality and pollution levels, which provide real-time data to authorities and the public.



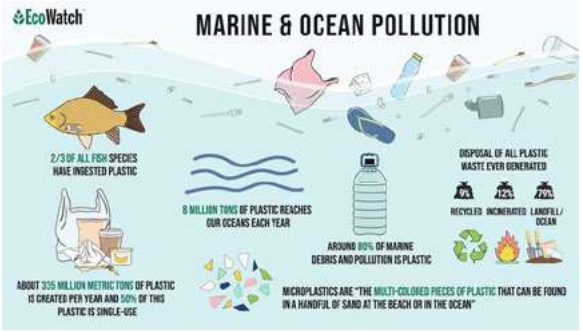


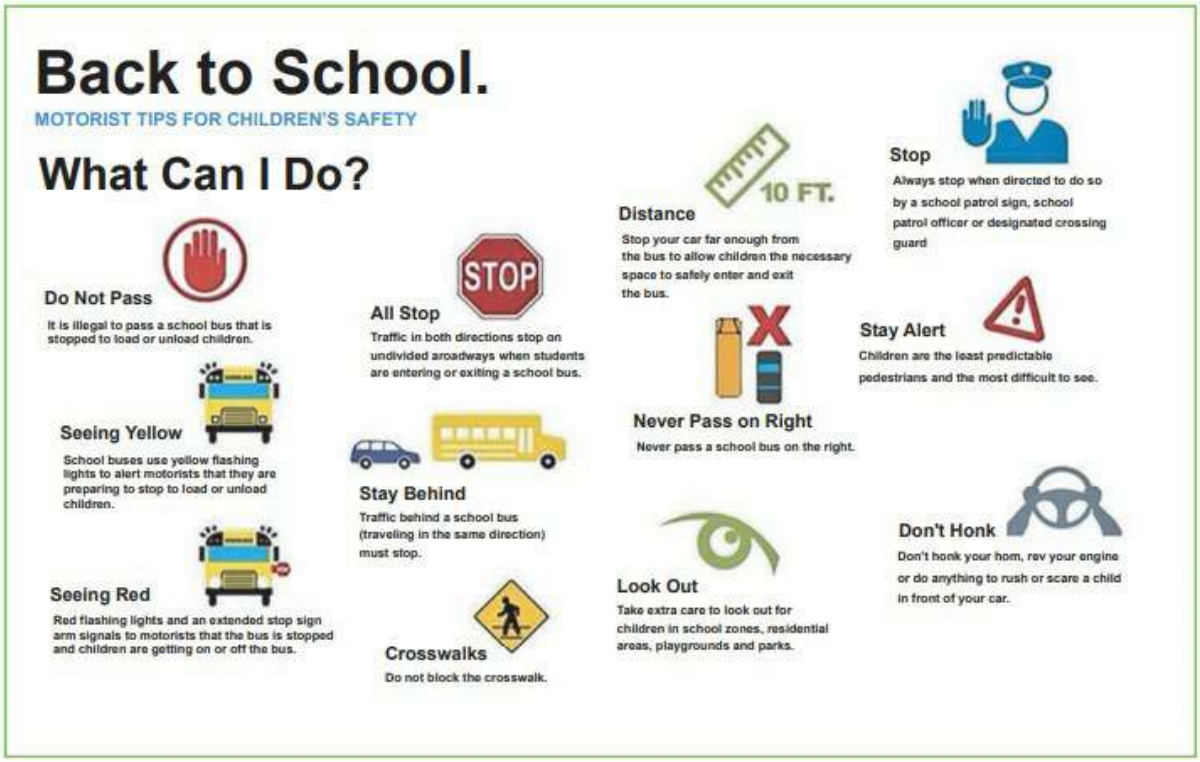
National Academia Input
Search & Rescue, Law Enforcement

- Courts should begin to consider holding fossil fuel producers accountable for damage. Moreover, Advocating for stricter regulations on waste disposal, pollution control, and sustainable fishing practices.
- Develop protocols and procedures for responding to pollution incidents encountered during search and rescue operations.

International Academia Input
Search & Rescue, Law Enforcement

- Ensure the national policies and legislation should be aligned with international commitments to achieve sustainable development goals.
- Establish guidelines for safely documenting and reporting pollution incidents, coordinating with environmental agencies, and providing assistance as needed to contain or mitigate pollution impacts.





(d) Contingency – Industrial / Urban Disasters

National Academia Input
Individual & Community Level

- Follow the safety guidelines and regulations when working or living near industrial areas.
- Follow instructions from authorities during emergencies and participate in drills and training exercises to prepare for disasters.
- Collaborate with local communities to raise awareness about fire safety and promote responsible waste disposal practices.

International Academia Input
Individual & Community Level

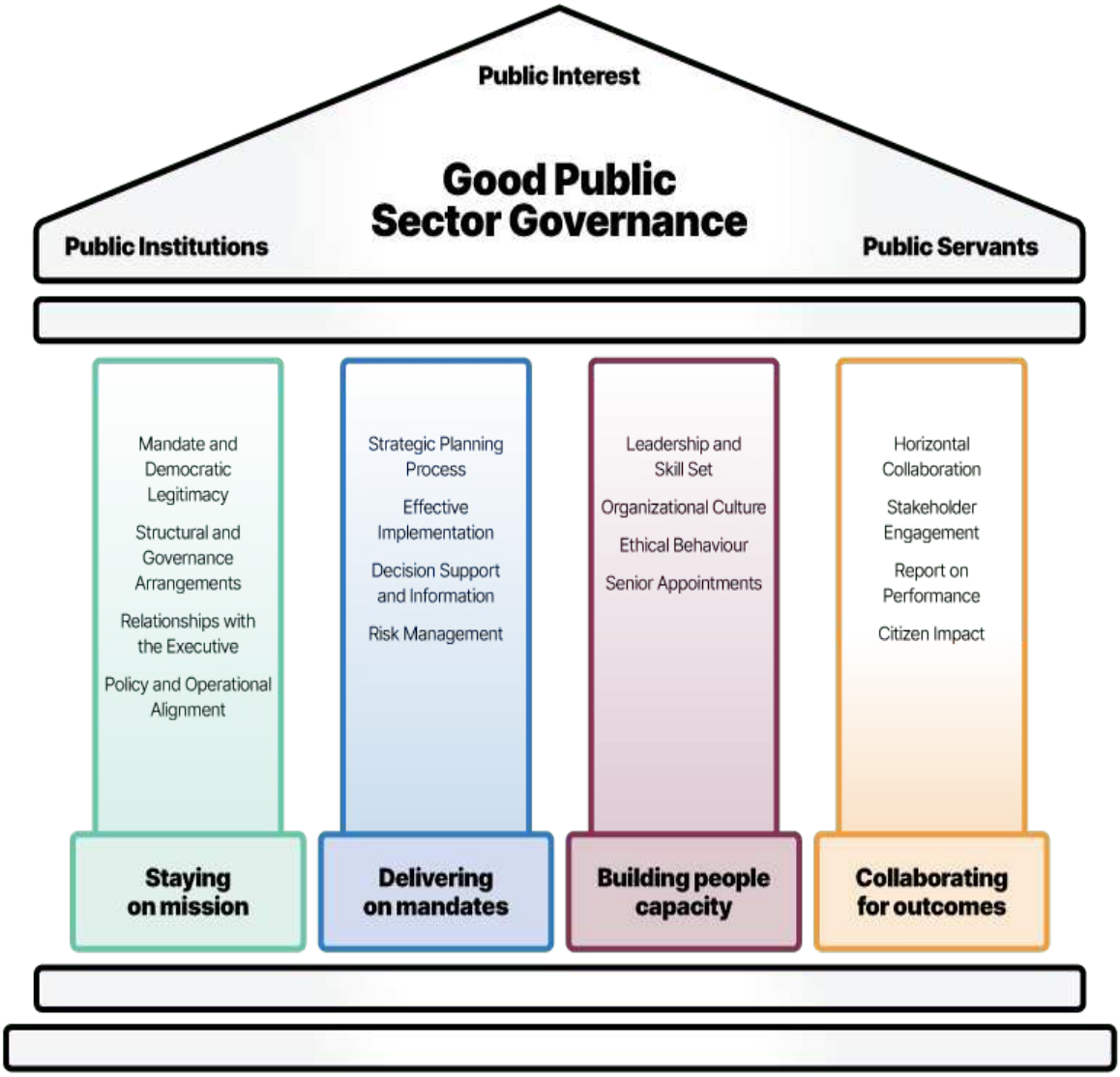
- Train the employees in fire prevention, use of fire extinguishers, and evacuation procedures, fostering a safety-conscious culture within the workplace.
- Minimize exposure to hazardous materials and activities that could increase the risk of accidents or disasters, such as smoking near flammable materials or tampering with industrial equipment.
- Develop a personal emergency plan that includes evacuation routes, emergency contacts, and essential supplies such as food, water, medications, and first aid kits.

National Academia Input
Area Governance

- Build community resilience by promoting social cohesion, strengthening local institutions, and empowering communities to take ownership of their own disaster preparedness and response efforts.
- Conduct comprehensive risk assessments to identify potential urban and industrial disaster scenarios and develop mitigation and response plans accordingly.

International Academia Input
Area Governance

- Formulate a special Daily Reporting System (DRS) on Industrial fires and propose possible prevention in future.
- Implement environmental monitoring and regulatory frameworks to prevent pollution, reduce environmental risks, and enforce compliance with safety standards in industrial and urban areas.

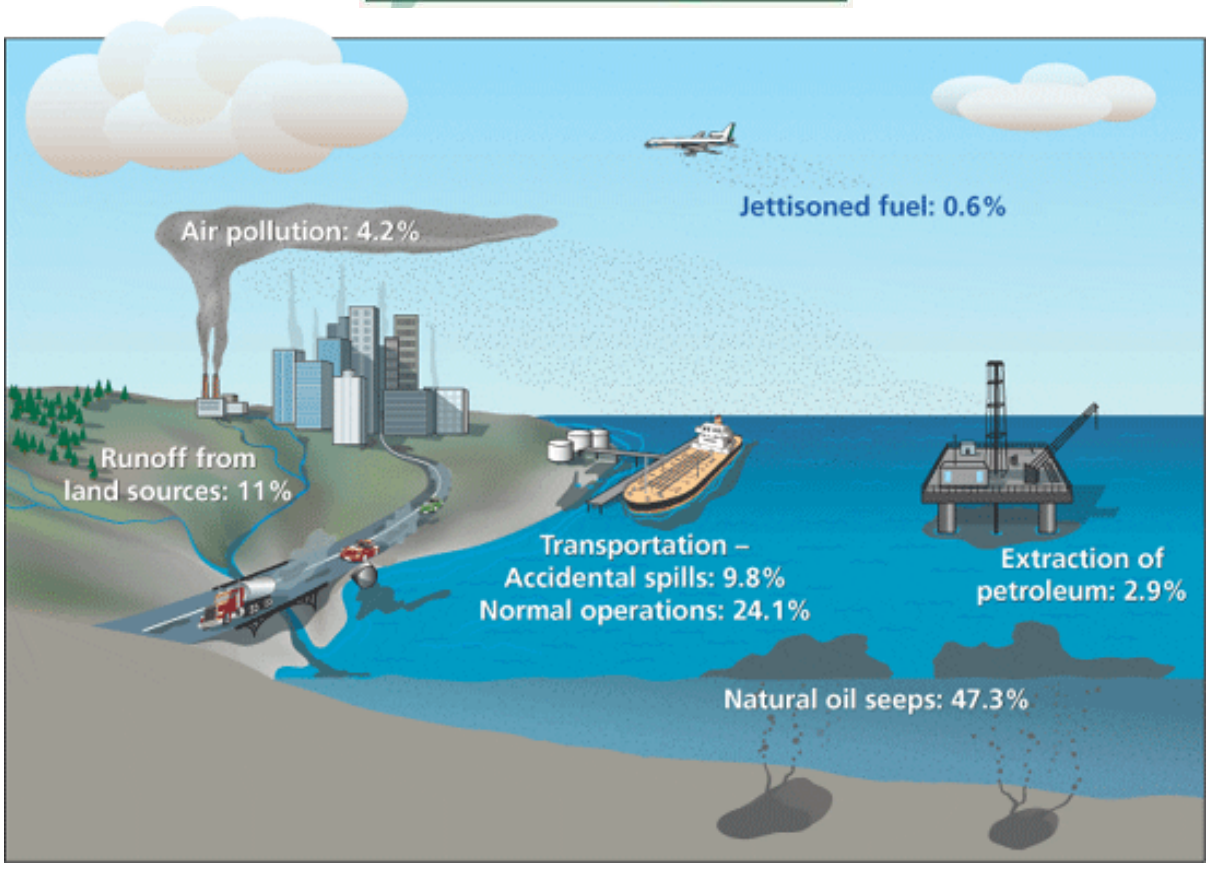


National Academia Input
Role of Federal Organizations

- Implement effective waste management practices to minimize flammable waste and reduce fire risks.
- Strengthen partnerships between government agencies, private sector stakeholders, and civil society organizations to leverage resources, expertise, and technology for disaster mitigation and response efforts.

International Academia Input
Role of Federal Organizations

- Conduct joint training exercises with firefighters from other countries to enhance skills and interoperability.
- Promote economic diversification and sustainable development practices to reduce reliance on hazardous industries and create alternative livelihood opportunities for communities vulnerable to industrial disasters.

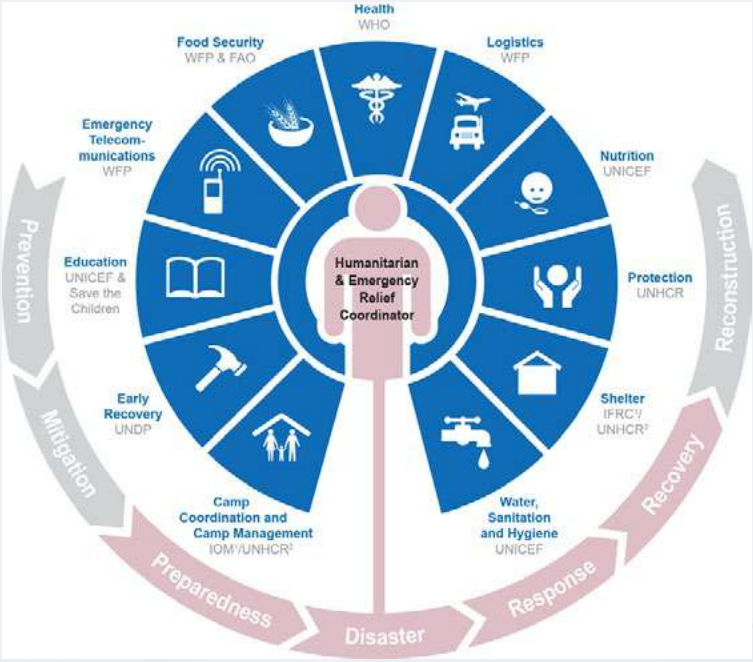


National Academia Input
Private Sector and Local Industry Role

- Undertake hazard and risk analysis during design and planning stages of new infrastructure and industry.
- Develop advanced monitoring systems, early warning mechanisms, and predictive analytics tools to detect and respond to potential urban and industrial disasters proactively

International Academia Input
Private Sector and Local Industry Role

- Encourage the use of less flammable and toxic chemicals in industrial processes.
- Invest in research and development initiatives to develop new technologies and solutions for urban disaster risk reduction and resilience building.

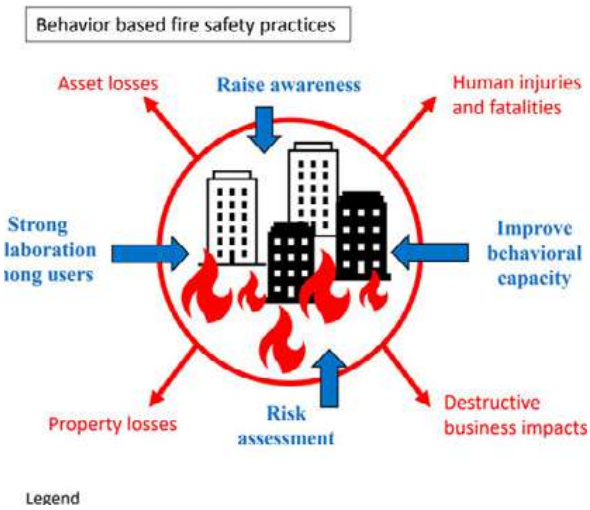


National Academia Input
NGOs, Humanitarian Resource Enablers

- Train and equip community members to assist firefighters in evacuation and initial response efforts.
- Foster partnerships between government agencies, civil society organizations to leverage resources, expertise, and technology for disaster mitigation and response efforts.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Establishment of firefighting schemes and techniques.
- Promote economic diversification and sustainable development practices to reduce reliance on hazardous industries and create alternative livelihood opportunities for communities vulnerable to industrial disasters.

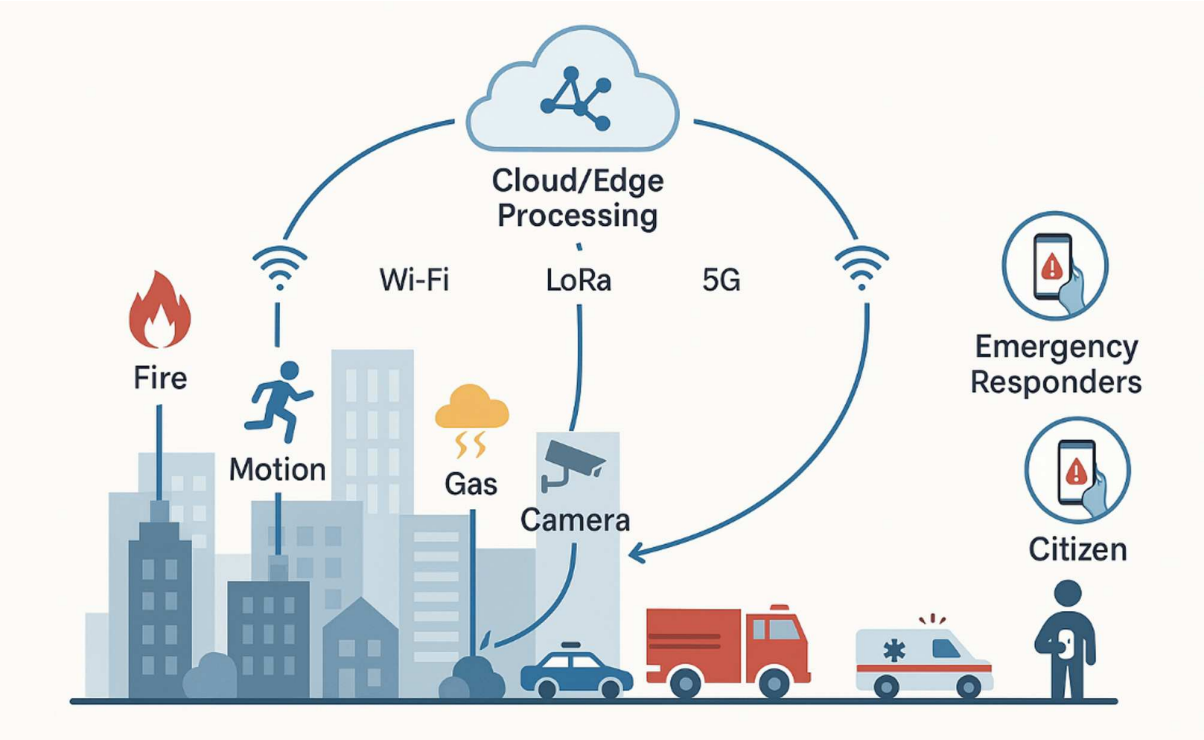


National Academia Input
Area Academia, Think Tanks

- Design fire-safe structures with mandatory safety regulations and standards.
- Mark fire exits and escape routes clearly. Keep them unobstructed at all times
- To prevent industrial fires in coastal areas following steps should be taken;
  - Stand Pipes System (Residential)
  - Automatic Sprinkler System (Institutional Buildings)
- Installation of Interior Fire Alarm System (hotels, motels, dormitories, hospitals, asylums, nursing homes etc.)

International Academia Input
Area Academia, Think Tanks

- Invest in sprinkler systems, automatic doors, and foam suppression systems tailored to specific fire risks.
- Review and update the risk assessment regularly
- Undertake drills at industrial unit level in order to prepare for any catastrophic events.
- Moreover, Tourists should receive timely updates and instructions to respond effectively to evolving coastal hazards and changing weather conditions



National Academia Input
Local Media and Early Warning Center

- Improve communication and cooperation with other non-governmental organizations, governmental and UN organizations, and humanitarian actors engaged in disaster relief and emergency response
- Use communication networks to disseminate timely alerts through various channels, including radio broadcasts, mobile phone notifications, social media platforms, and sirens.

International Academia Input
Local Media and Early Warning Center

- Support aerial surveillance and situational awareness.
- Develop Machine learning algorithms and predictive analytics which facilitate the development of sophisticated models for predicting the early heat, intensity, and trajectory of disaster.

National Academia Input
Search & Rescue, Law Enforcement

- Develop comprehensive preparedness plans tailored to urban and industrial disaster scenarios, considering factors such as building collapses, industrial accidents, chemical spills, and infrastructure failures.
- Utilize cash-based assistance modalities such as cash transfers, vouchers, and mobile money transfers to provide affected populations with the flexibility to purchase their most urgent needs locally.

International Academia Input
Search & Rescue, Law Enforcement

- Quality standards certifications should be made mandatory.
- Collaborate with local authorities, emergency services, and industrial stakeholders to identify potential risks, establish response protocols, and coordinate resources.

(e) Contingency – Sea Water Incursions in Delta

National Academia Input
Individual & Community Level

- Raise awareness in coastal communities about saltwater intrusion, sustainable water uses practices, and the importance of preserving natural coastal defenses (Mangroves) is vital.
- Engage in respectful dialogue with elders and traditional knowledge holders to gather and document their understanding of coastal environments and water resources.

International Academia Input
Individual & Community Level

- Promote conservation and management of open space, wetlands, and/or sea level rise boundary zones to separate developed areas from high hazard areas.
- Use traditional knowledge about adapting fishing practices to changing salinity levels or exploring alternative livelihoods suitable for salinized environments might be present.

National Academia Input
Area Governance

- Switch to the cultivation of salt tolerant crops which can ensure agricultural productivity and protect farmer's livelihoods.
- Develop and implement coastal zone management plans that protect coastal habitats and natural barriers, such as mangroves and wetlands, which can help reduce the impact of sea water intrusions.

International Academia Input
Area Governance

- Avoid drilling in locations immediately adjacent to the coast within 50 m.
- Avoid using technologies such as hydrofracturing in areas <100 m from the coast to reduce risk of opening fractures that are directly connected with the sea.

National Academia Input
Role of Federal Organizations

- Incorporate urban wetland protection into infrastructure planning.
- Preserve and restore the structural complexity and biodiversity of vegetation in tidal marshes, seagrass, meadows.
- Construct numerous small dams for storing water to be used in times of droughts.
- Install Reverse Osmosis (RO) desalination and filtration plants to make water drinkable.

International Academia Input
Role of Federal Organizations

- Create dunes along backshore of beach; includes planting dune grasses and sand fencing to induce settling of wind-blown sands
- Increased shoreline setbacks and building physical barriers underground near the coast can block saltwater flow and protect freshwater aquifers.
- Revitalize mangrove ecosystems along the coast is crucial.
- Use of crop stalks and plastic covering to reduce salt content by 36% (China).

National Academia Input
Private Sector and Local Industry Role

- Invest in research, development, and deployment of cost-effective and energy-efficient desalination plants suitable for Pakistan's coastal areas.
- Invest in Managed Aquifer Recharge (MAR) projects can replenish depleted coastal aquifers

International Academia Input
Private Sector and Local Industry Role

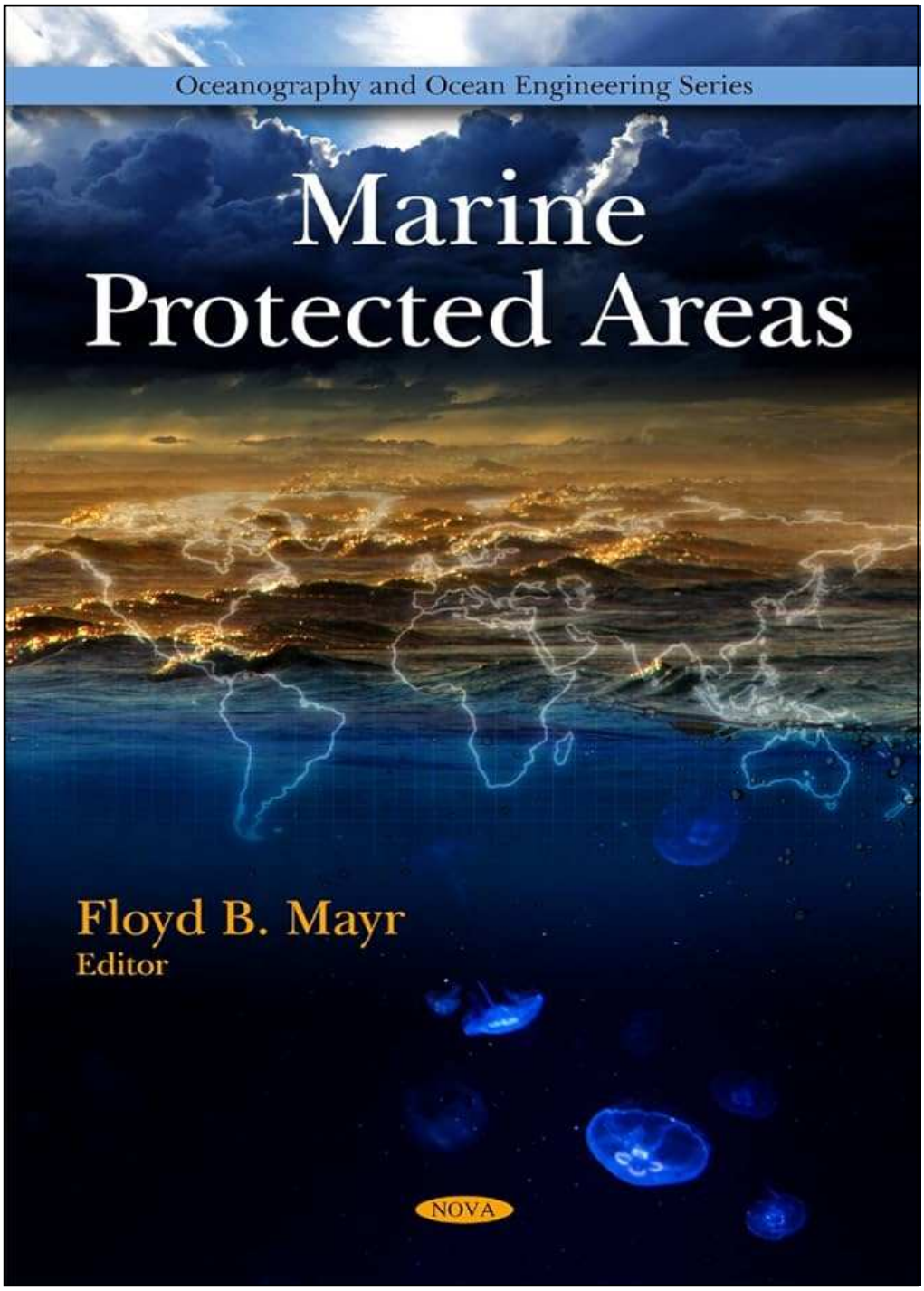
- Adopt successful groundwater management models where strict regulations and monitoring systems govern water extraction.
- Invest in wastewater treatment systems and explore the reuse of treated water for industrial processes or irrigation, alleviating strain on freshwater resources.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Support Small scale rainwater harvesting initiatives in rural communities for providing alternative water sources and reducing pressure on groundwater.
- Support for pilot projects testing innovative technologies and management practices tailored to Pakistan's coastal regions is crucial.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Encourage Coastal Land Reclamation that involves the artificial extension of the coastline towards the sea.
- Support infrastructure development for rainwater harvesting, including rooftop systems, storage tanks, and recharge wells which helps store excess monsoon rainwater for later use.

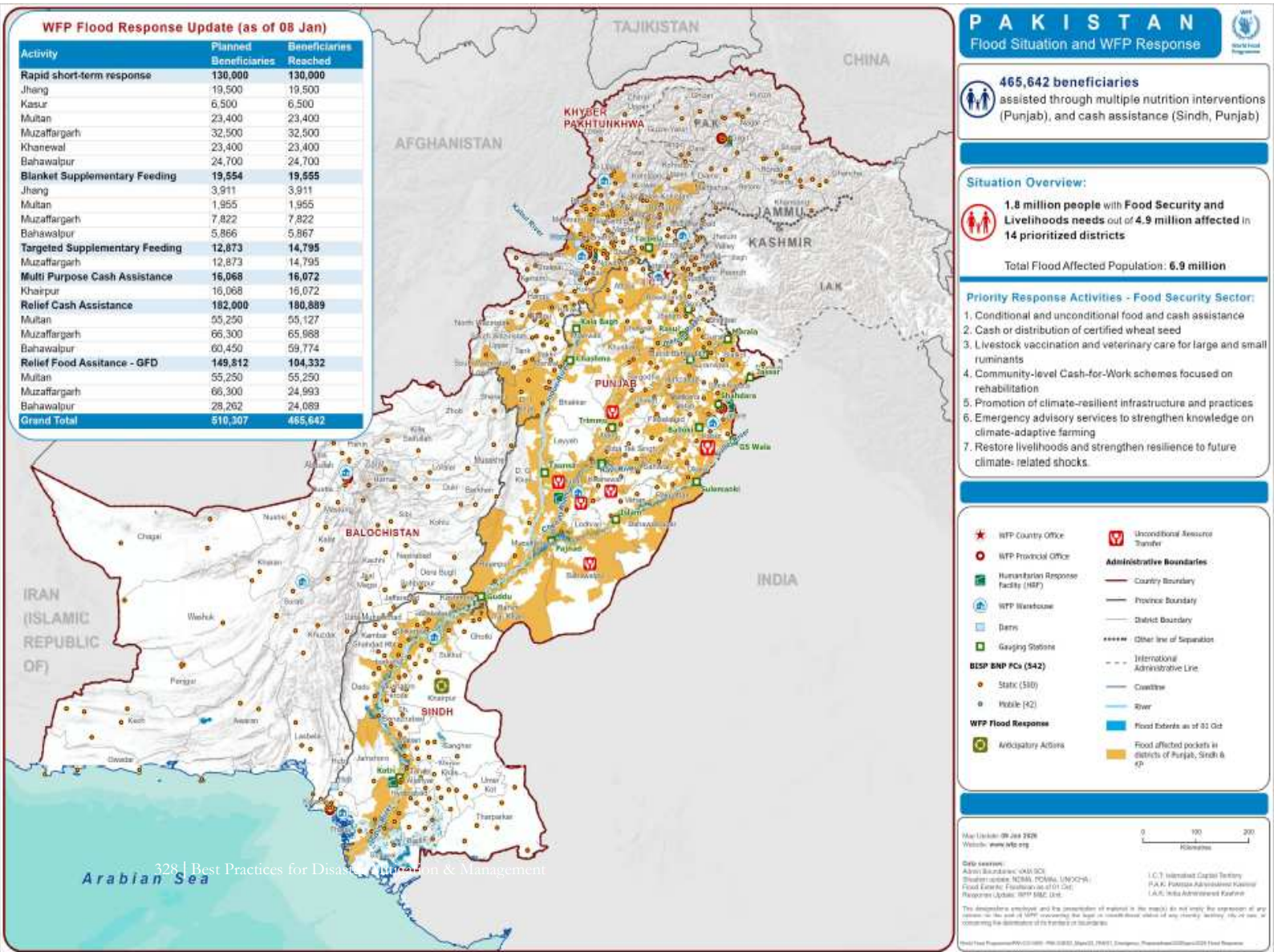


National Academia Input
Area Academia, Think Tanks

- Redefine river flood hazard zones to match the projected expansion of flooding frequency and extent
- Use natural breakwaters of mangroves and oysters (or install other natural breakwaters) to dissipate wave action and protect shorelines
- Industries can adopt water saving technologies and practices, reducing freshwater demand, and thus decreasing groundwater extraction.

International Academia Input
Area Academia, Think Tanks

- Use soft techniques such as cliff stabilization, coastal dune protection and restoration.
- Utilize hard techniques including, offshore breakwaters, groynes and seawalls/revetments.
- Consider leveraging traditional knowledge for constructing houses or other structures using local materials that can withstand saltwater intrusion.



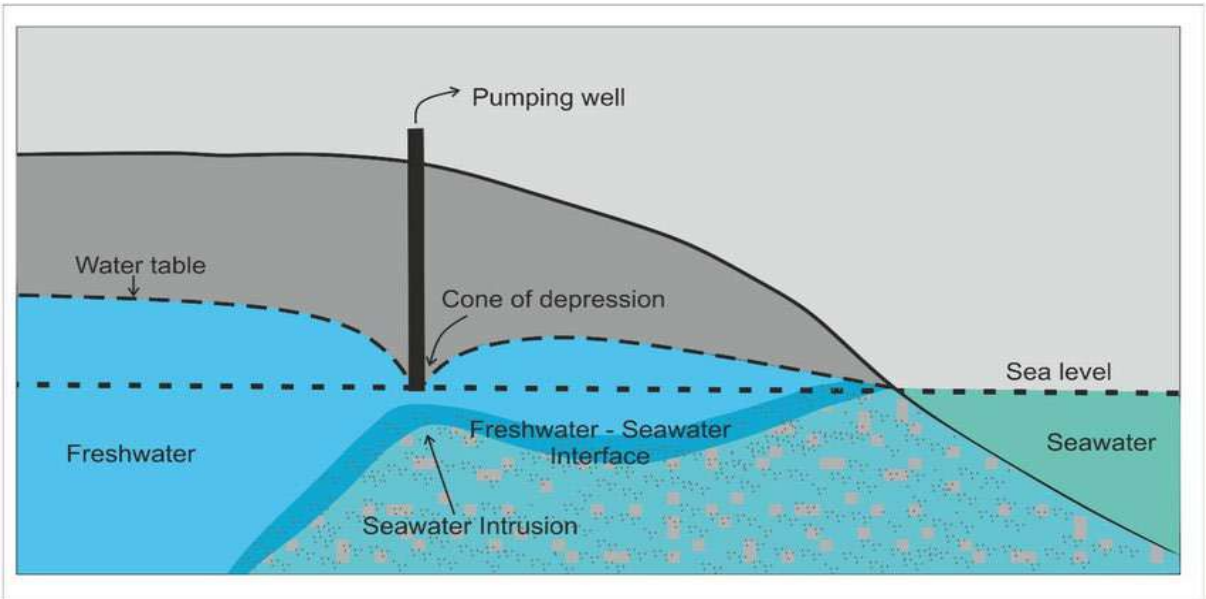
Activity	Planned Beneficiaries	Beneficiaries Reached
Rapid short-term response	**130,000**	**130,000**
Jhang	19,500	19,500
Kasur	6,500	6,500
Multan	23,400	23,400
Muzaffargarh	32,500	32,500
Khanewal	23,400	23,400
Bahawalpur	24,700	24,700
Blanket Supplementary Feeding	**19,554**	**19,555**
Jhang	3,911	3,911
Multan	1,955	1,955
Muzaffargarh	7,822	7,822
Bahawalpur	5,866	5,867
Targeted Supplementary Feeding	**12,873**	**14,795**
Muzaffargarh	12,873	14,795
Multi Purpose Cash Assistance	**16,068**	**16,072**
Khairpur	16,068	16,072
Relief Cash Assistance	**182,000**	**180,889**
Multan	55,250	55,127
Muzaffargarh	66,300	65,988
Bahawalpur	60,450	59,774
Relief Food Assitance - GFD	**149,812**	**104,332**
Multan	55,250	55,250
Muzaffargarh	66,300	24,993
Bahawalpur	28,262	24,089
Grand Total	**510,307**	**465,642**

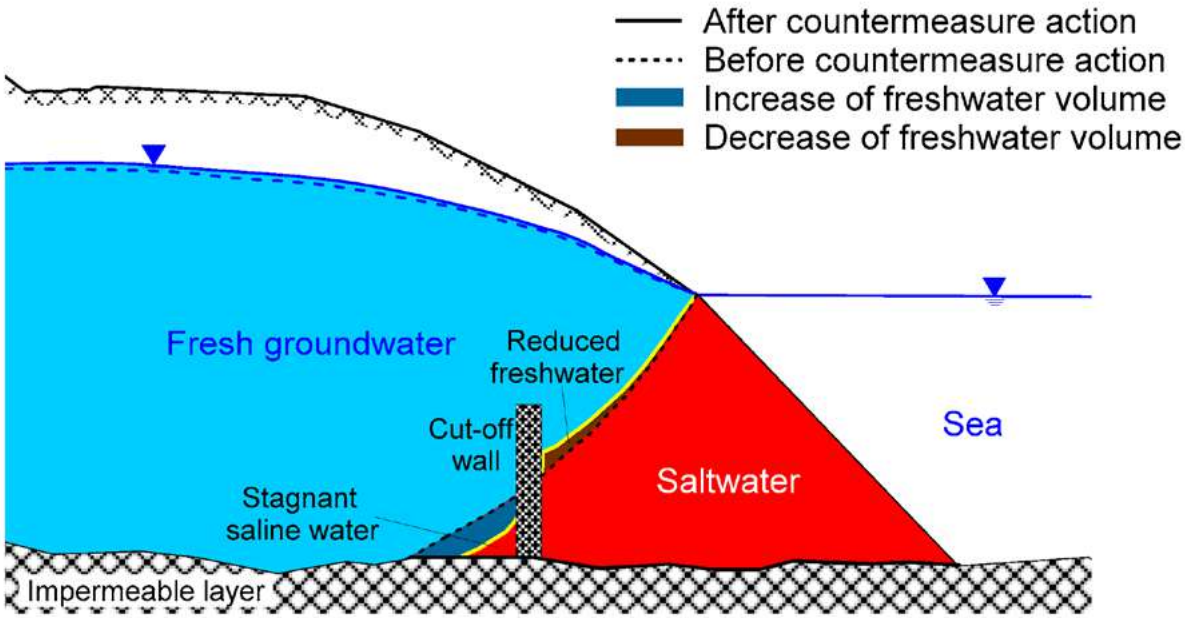
National Academia Input
Local Media and Early Warning Center

- Develop sensors and monitoring systems to track groundwater salinity levels, saltwater intrusion patterns, and aquifer health in real-time. This data is vital for informed decision-making.
- Monitor the regions which are impacted by sea intrusion.
- Develop an early warning system for cyclones and storm surges that can help to assess risks related to seawater intrusion.

International Academia Input
Local Media and Early Warning Center

- Establish Groundwater Monitoring Network which can measure groundwater levels, salinity (salt content), and other key parameters.
- Use of Advanced methods like Electrical Resistivity Tomography (ERT) and electromagnetic surveys can be used to map subsurface salinity distribution which can help us to identify the extent and advancement of the saltwater intrusion front.
- Develop numerical models incorporating hydrogeological data, climate patterns, and water use trends to predict saltwater intrusion hotspots and scenarios.





National Academia Input
Search & Rescue, Law Enforcement

- Provisions of the Penal Code relating to public nuisance or causing damage to water bodies could be applicable if industries or individuals are found to be directly contributing to actions that exacerbate seawater intrusion.
- Establish protocols and resources for emergency response and relief efforts during severe droughts, including emergency water distribution, financial assistance for impacted communities, and support for vulnerable populations.

International Academia Input
Search & Rescue, Law Enforcement

- Provide security for critical infrastructure like desalination plants or monitoring stations in coastal regions, which are vital for managing seawater intrusion.
- Develop and implement comprehensive drought preparedness plans that include strategies for water conservation, demand management, drought monitoring, and response measures tailored to local conditions.

(f) Contingency – Earthquakes, Tsunamis

National Academia Input
Individual & Community Level

- Individuals and communities can adopt practices such as constructing earthquake-resistant buildings and developing family emergency plans that include evacuation routes and communication protocols.
- Develop and implement educational programmes in schools and communities to make citizens aware of earthquake hazards and preparedness actions.
- Establish a line of responsibility and measures to assess the safety of buildings before earthquakes.
- Pakistan should enact legislation requiring public schools to establish emergency preparedness systems, including disaster plans and preparedness training for both staff and students.

International Academia Input
Individual & Community Level

- Apply earthquake resilient infrastructure in buildings, bridges, power lines, and communication networks.
- Team SAFE-T is an education-based program to improve school safety and family readiness. by making preparedness activities an integral part of the school year.
- Regular building inspection operations should be conducted to avoid the catastrophic impacts of an earthquake.
- Establish emergency preparedness systems, encompassing disaster plans, and preparedness training for both staff and students.

National Academia Input
Area Governance

- Enforce earthquake resistant construction codes and retrofitting protocols for vulnerable buildings, especially critical infrastructure like hospitals, schools, and public buildings in the earthquake prone areas of Pakistan.
- Develop detailed vulnerability maps that pinpoint critical infrastructure elements most susceptible to earthquake damage, considering factors like soil type, track alignment, and bridge design.
- Retrofitting the high-risk infrastructure by using cost effective retrofitting techniques and ensuring compliance with building codes can significantly improve the seismic resilience of structures.

International Academia Input
Area Governance

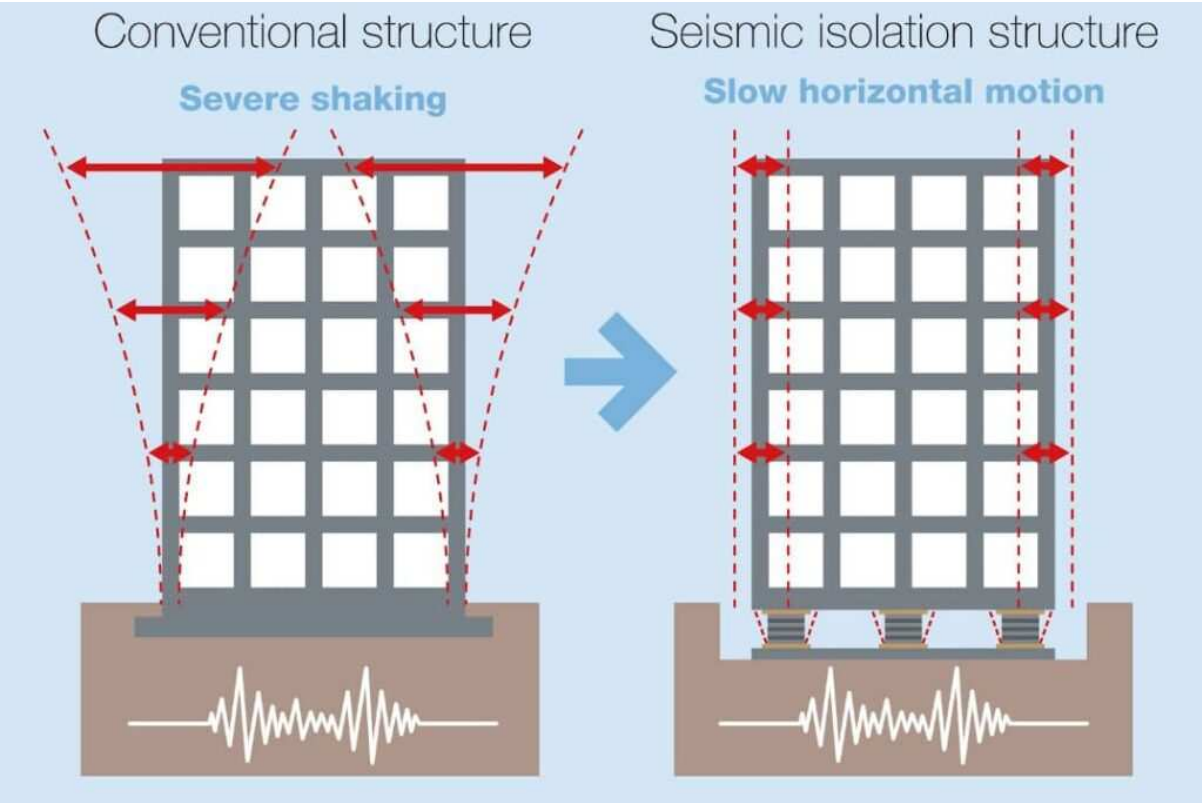
- Use of seismic retrofitting techniques for existing infrastructure buildings in earthquake prone areas (California).
- Develop vulnerability maps of infrastructures, using advanced technology and data analytics to identify and mitigate risks posed by natural disasters.
- Strengthen building structures, reinforcing foundations, and installing seismic isolation and damping systems to reduce the impact of ground shaking during earthquakes.

National Academia Input
Role of Federal Organizations

- Collaborate with provincial and local authorities to develop and implement comprehensive earthquake risk management plans.
- Ensure the availability of safe and accessible shelters for displaced populations, providing essential services like food, water, sanitation, and healthcare.

International Academia Input
Role of Federal Organizations

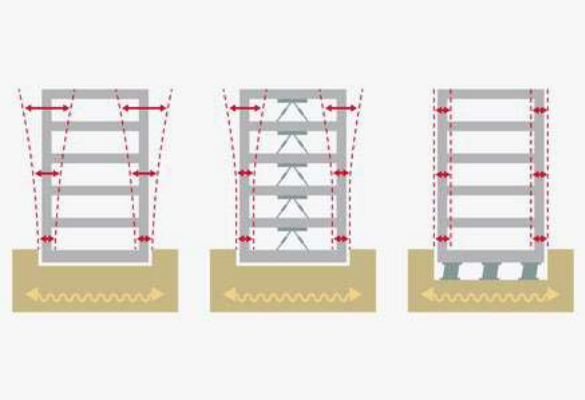
- Establish robust seismic monitoring networks, conduct vulnerability assessments of critical infrastructure, and coordinate inter agency exercises and drills to test response capabilities.
- Develop rapid response mechanisms to deploy social workers and volunteers to affected areas immediately after an earthquake.



National Academia Input

Private Sector and Local Industry Role

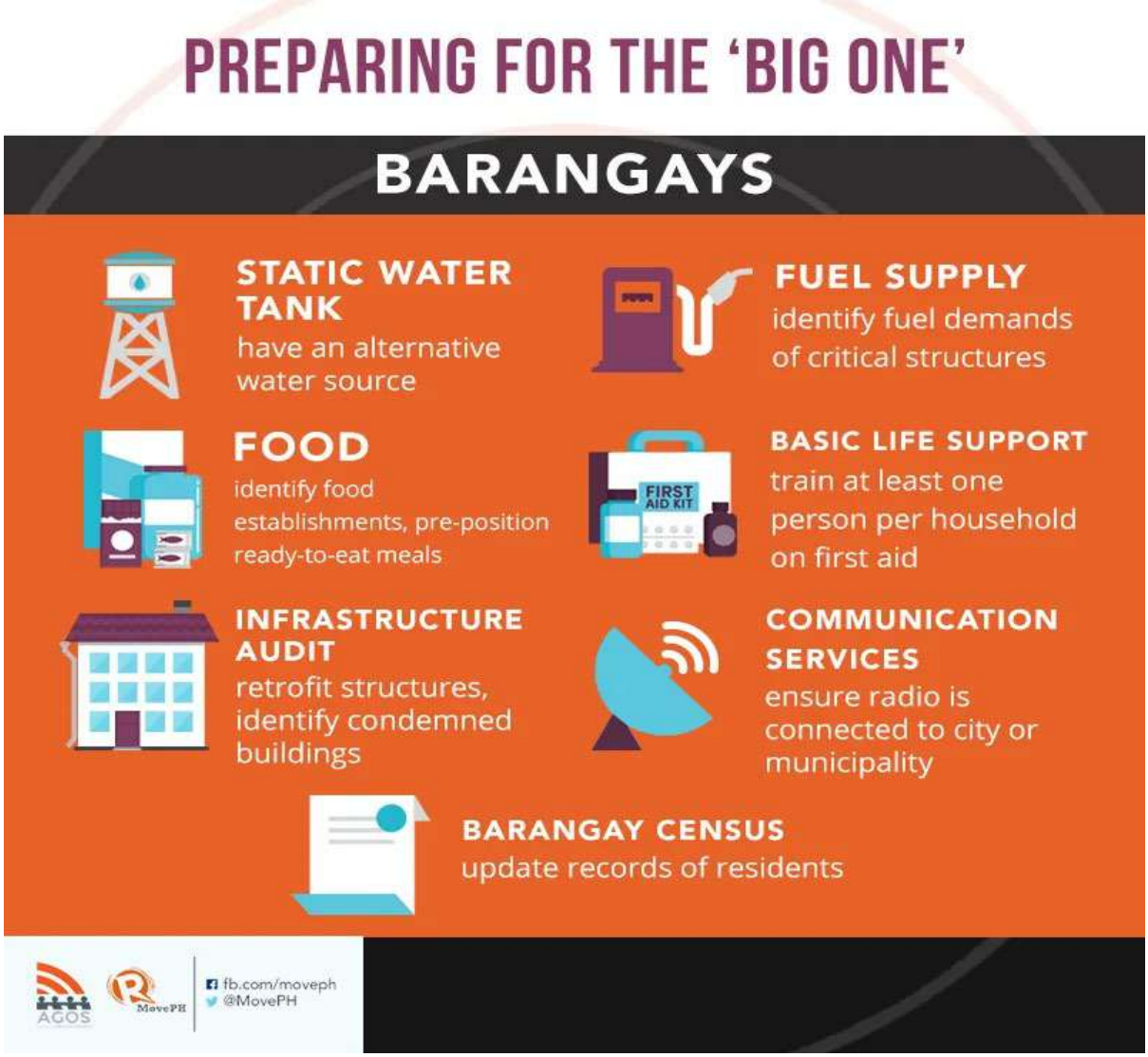
- Producing earthquake resistant building materials that are specifically designed to withstand seismic forces.
- Adopt cost effective seismic retrofitting techniques.



International Academia Input

Private Sector and Local Industry Role

- Private sector and local industry should provide reinforced concrete, steel reinforcement bars, and masonry blocks that meet building codes and standards for seismic construction
- Produce innovative retrofitting techniques and construction materials that enhance the seismic resilience of buildings.



National Academia Input
NGOs, Humanitarian Resource Enablers

- Outline area wise procedures for search and rescue operations, medical aid distribution, damage assessment and resource allocation.
- Outline seismic zone wise procedures for search and rescue operations, medical aid distribution, damage assessment, resource allocation, and communication protocols in the aftermath of an earthquake.
- Create easy-to-understand content in local languages, such as brochures, posters, and videos, to convey crucial information about earthquake preparedness.
- Work with homeowners and public institutions to identify and prioritize retrofitting critical infrastructure and buildings, focusing on schools, hospitals, and shelters.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Work with local communities and authorities to identify areas most vulnerable to earthquakes consider factors like housing quality, infrastructure access, and population density.
- Development of a clear and practical plan setting out roles, responsibilities and processes for carrying out initial damage assessment immediately following a major earthquake.
- Use visual aids such as illustrations, diagrams, and infographics to supplement written content and enhance understanding, mainly for individuals with low literacy level.
- Build trust and partnerships with local communities through participatory risk assessments, awareness campaigns, and capacity building workshops.

National Academia Input
Area Academia, Think Tanks

- Conduct comprehensive seismic hazard mapping including active fault zones, and regions with high seismic risk and assess potential impacts on infrastructure, communities, and ecosystems.
- Train and equip researchers, disaster management personnel, and University students with the necessary skills and knowledge to effectively manage earthquake risks.
- Include lessons in science, geography and social studies, to teach about earthquake science, risk assessment, disaster management, and community resilience.
- Conducts research to develop and improve drones and robots specifically designed for SAR operations.

International Academia Input
Area Academia, Think Tanks

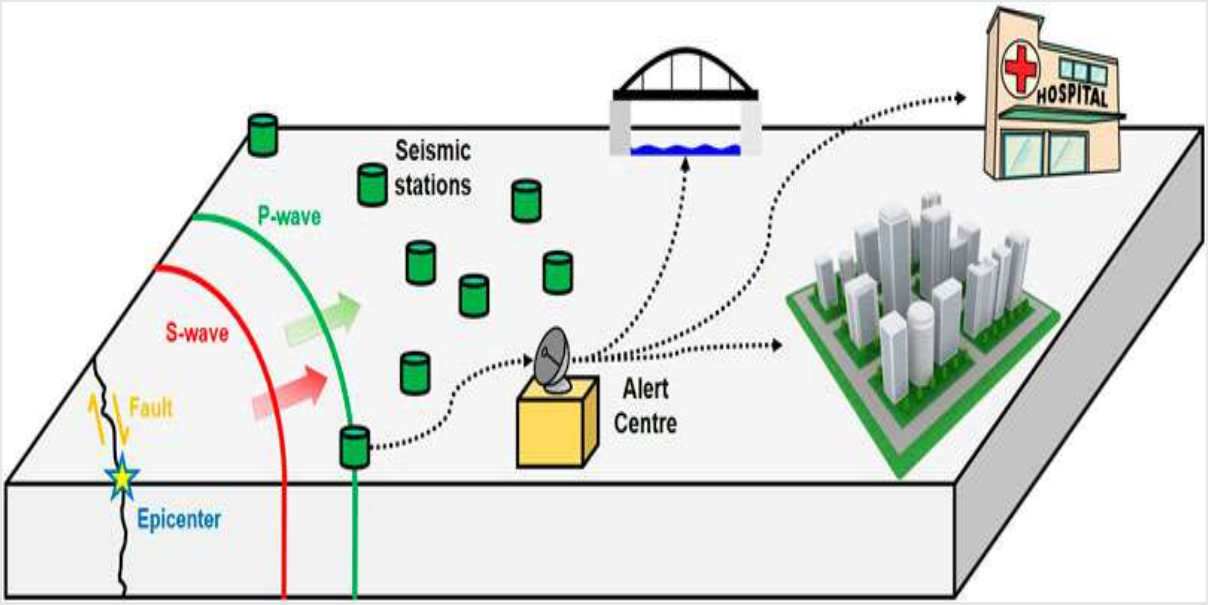
- Conduct seismic hazard mapping to identify areas prone to earthquakes, including active fault zones, subduction zones, and regions with high seismic activity.
- Academic institutions should conduct extensive research to analyze past earthquakes, monitor current seismic activity, and develop predictive models.
- Earthquake awareness training in academic institutions is essential for educating students about the risks associated with earthquakes and preparing them to respond effectively in case of an earthquake.
- Use of Robotic system and AI to search for earthquake victims.

National Academia Input
Local Media and Early Warning Center

- Establishment of a robust network of seismic sensors placed across the country to detect seismic waves and trigger timely alerts to at risk communities and authorities
- Development and dissemination of earthquake awareness campaigns in regional languages for maximum reach and effectiveness.

International Academia Input
Local Media and Early Warning Center

- Developing a seismic monitoring and early warning system aims to provide rapid and accurate alerts to individuals, communities, and organizations allowing for timely response and mitigation efforts.
- Launch comprehensive public awareness campaigns to educate citizens about earthquake safety, preparedness measures, and early warning systems.

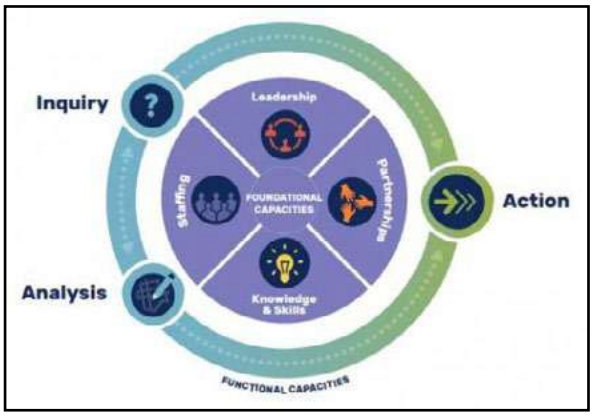


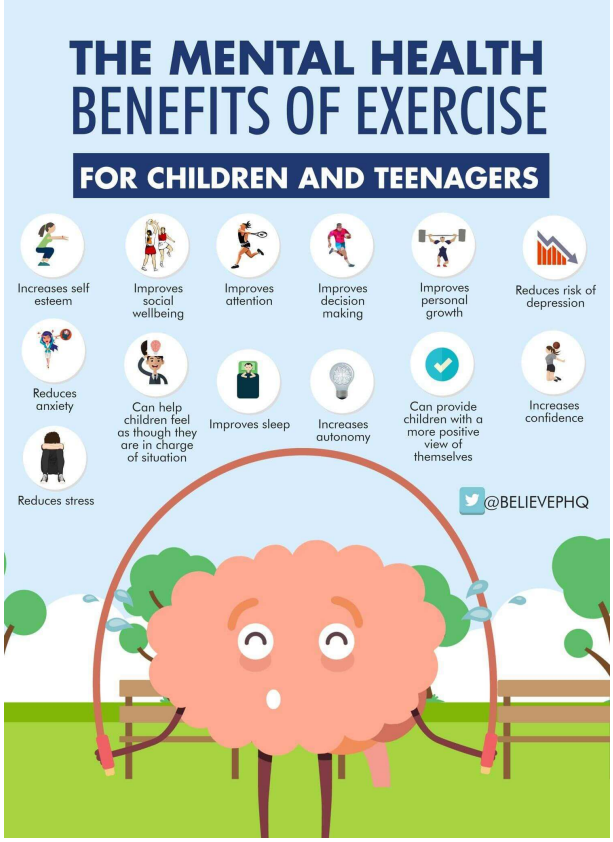
National Academia Input
Search & Rescue, Law Enforcement

- Implement land use regulations that restrict development in high risk zones like fault lines and unstable slopes.
- Encourage earthquake resistant construction practices and building codes.
- Implement earthquake resistant design standards for new construction projects, incorporating features like seismic isolation bearings, ductile materials, and redundant communication channels.
- Developing Comprehensive disaster plans for schools in the earthquake prone areas are needed which ensure the safety and well being of students and staff during the earthquake.

International Academia Input
Search & Rescue, Law Enforcement

- Enhance building standards and promoting seismic resilience in communities prone to earthquakes.
- The following building performance objectives should be considered a) Ground motion activity (b) collapse prevention (c) secondary effect (tsunamis, landslides (d) socio economic impact to the community.
- Develop comprehensive disaster plans for schools involving various stakeholders. School awareness materials should be provided to all citizens.





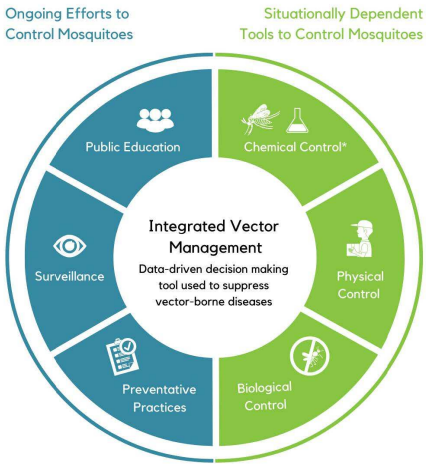
(g) Contingency – Epidemics, Vector Borne Diseases

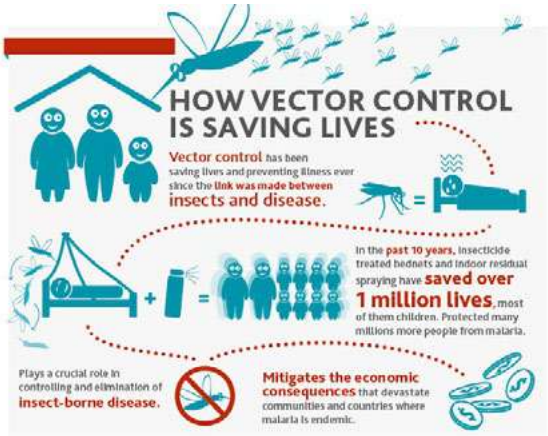
National Academia Input
Individual & Community Level

- Connect with appropriate state authorities to maintain a steady flow of information and updates, facilitating the adoption of best practices and safety measures.
- Adhere to directives issued by authorities, including wearing masks, practicing safe distancing, minimizing non-essential travel, and adhering to lockdown measures.
- Organize community-centered health education campaigns to inform residents about epidemic preparedness and preventive measures.

International Academia Input
Individual & Community Level

- Refrain from seeking information from sources other than official authorities and avoid spreading information that lacks credible sources.
- Refrain from socializing at venues such as restaurants, clubs, and places of worship to minimize the risk of spreading infections.
- Promote holistic well-being by emphasizing the importance of maintaining psychological and physical health through practices such as yoga, balanced diet, and regular exercise.



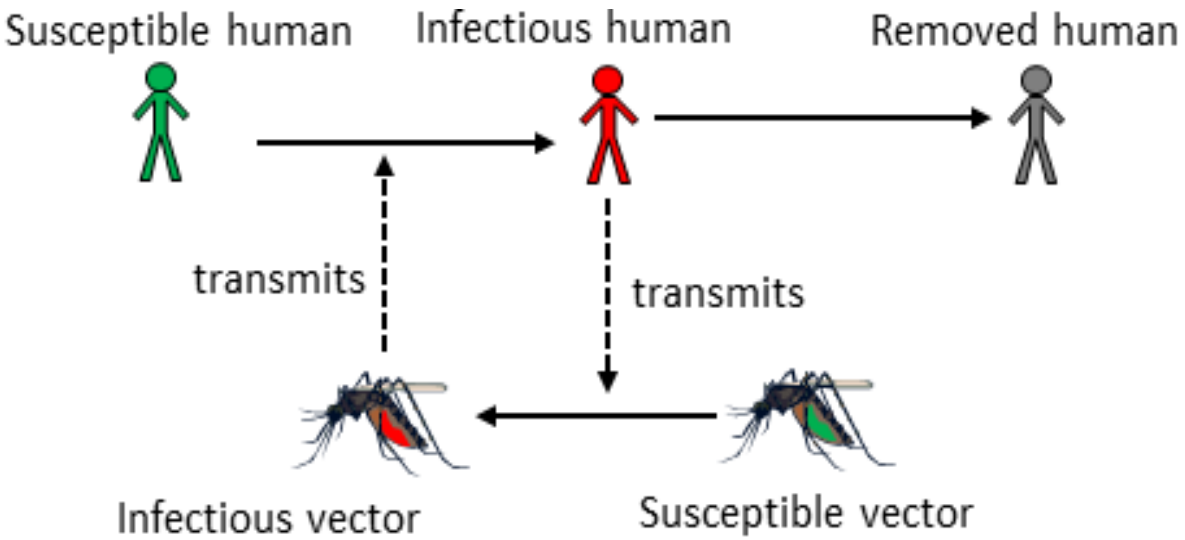


National Academia Input
Area Governance

- Form a rapid response team consisting of healthcare professionals, epidemiologists, and community health workers to promptly deploy to outbreak sites for effective containment and management
- Execute focused vaccination campaigns to immunize populations against prevalent vaccine-preventable diseases.

International Academia Input
Area Governance

- Establish specialized rapid response teams trained to swiftly deploy to outbreak hotspots (China).
- Regularly disinfect all public spaces, including hospitals, laboratories, dispensaries, public transport, and stations, to maintain cleanliness and minimize the risk of transmission



National Academia Input

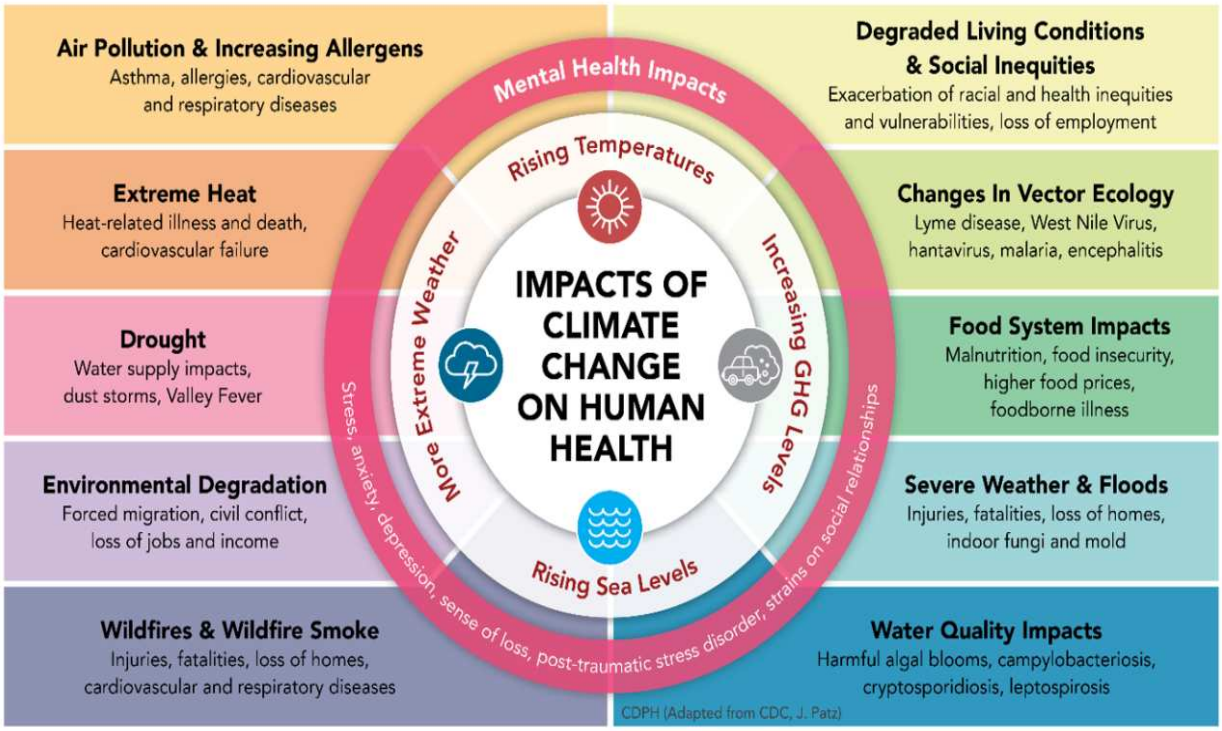
Private Sector and Local Industry Role

- Facilitate information sharing and collaborative decision-making to ensure a unified and comprehensive approach to epidemic control.
- Coordinate the dissemination of national and international best practices through community mobilizers.

International Academia Input

Private Sector and Local Industry Role

- Ensured logistical arrangements for the mobility and safety of labor, as well as the transportation of relevant industrial goods within its industrial complex (China)
- Invest in the development of new diagnostic tools, treatments, and vaccines to improve epidemic preparedness and response capabilities.

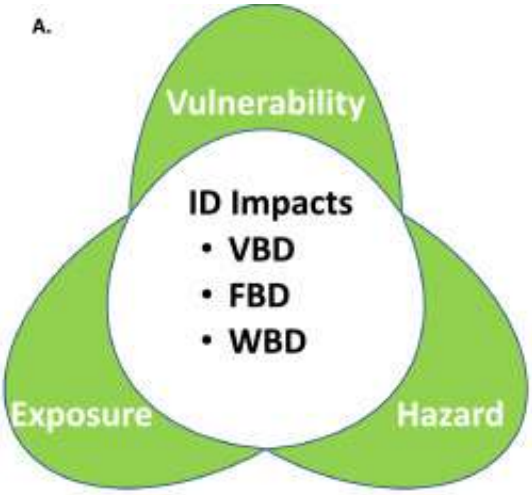


National Academia Input
NGOs, Humanitarian Resource Enablers

- Participate in international collaboration and partnership initiatives to utilize global expertise, resources, and technical support for epidemic preparedness and response endeavors.
- Provide healthcare services, such as screenings, vaccinations, and treatment, especially in underserved or remote areas where access to healthcare is limited.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Provide personnel with the necessary skills and knowledge to adeptly identify, manage, and contain epidemic outbreaks.
- Support vulnerable populations, such as children, the elderly, and those with pre-existing health conditions, who are often more susceptible to epidemics and vector-borne diseases.



Observed climate change impacts from infectious disease (ID) due to hazard, exposure and vulnerability

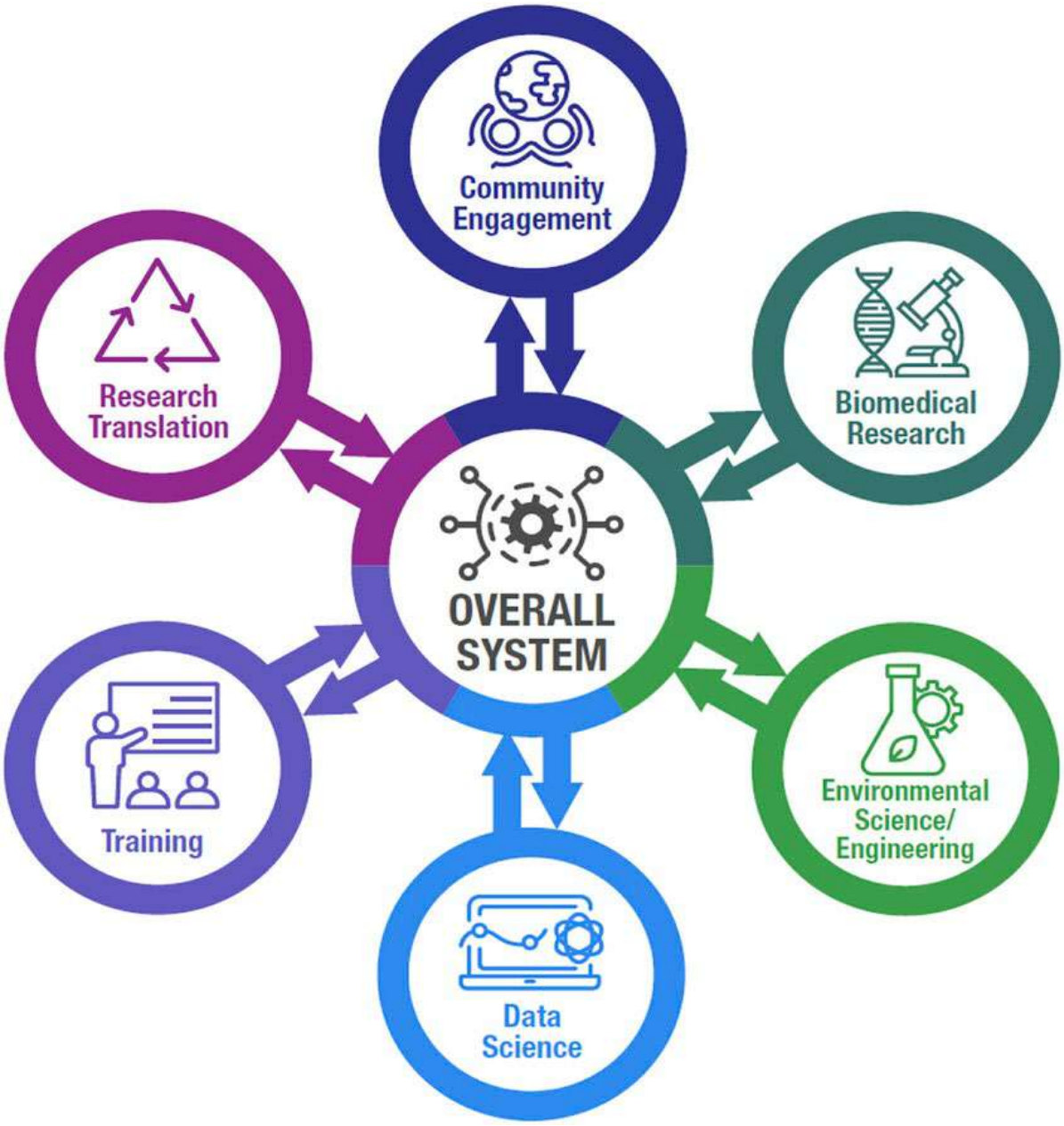
Projected risks from ID can be reduced in the future by acting on hazard, exposure and vulnerability through mitigation and adaptation

National Academia Input
Area Academia, Think Tanks

- Provide backing to local research institutions and academic centers to conduct epidemiological studies and assess the efficacy of intervention measures in diminishing disease burden.
- Use of artificially intelligent models trained according to given circumstances for forecasting
- Create virtual information integrated resource centers for the daily archiving and analysis of monitored data, enabling professionals and experts to observe trends and outcomes of various intervention attempts.

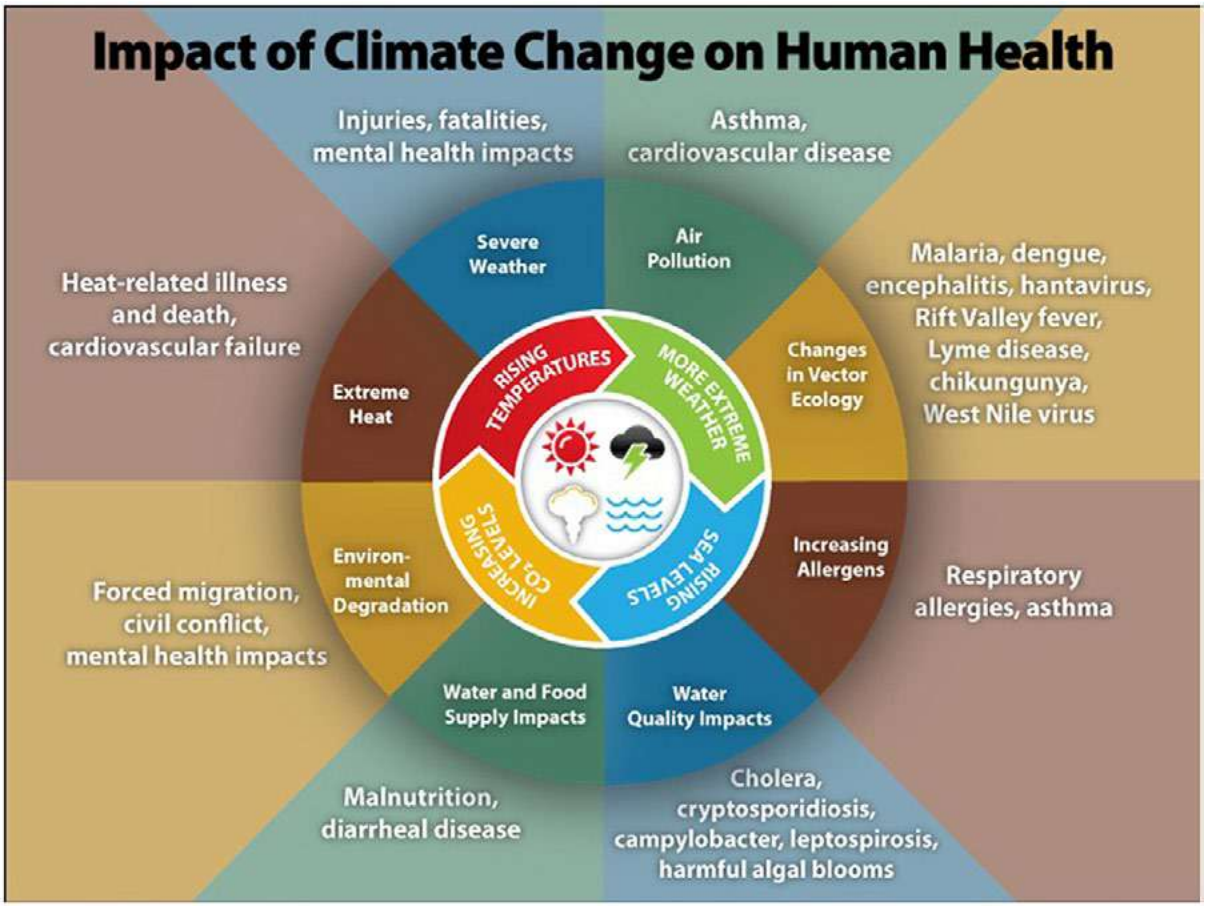
International Academia Input
Area Academia, Think Tanks

- Allocate resources from contingency funds to expedite the development of new diagnostic tools, treatments, and vaccines, enhancing epidemic preparedness and response capabilities
- Accelerate bioinformatics and genetics research, prioritizing gene drives via genetically modified viruses to counteract potentially harmful viruses.
- Develop innovative vector control strategies, such as genetically modified mosquitoes or novel insecticides, to reduce vector populations and prevent disease transmission.



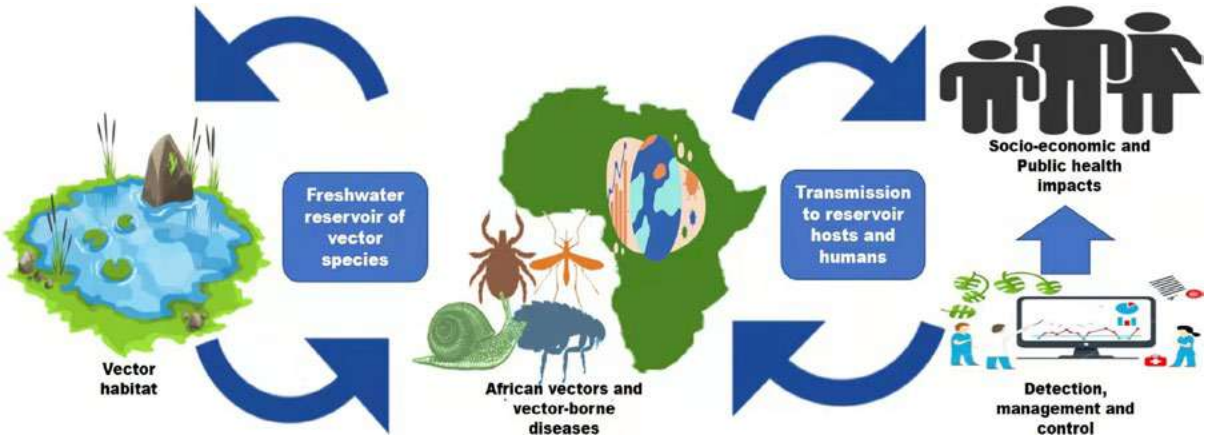
National Academia Input
Local Media and Early Warning Center

- Promote sensible and responsible journalism that aligns with the narrative of authorities and presents a realistic portrayal of conditions.
- Invest in research and development of innovative solutions for food security and social crises.



International Academia Input
Local Media and Early Warning Center

- Maintain balanced ground-level reporting that reflects both concerns and hopes within social sentiment.
- Use interactive content such as quizzes, polls, and infographics to engage the audience and educate them about VBDs in an interactive and memorable way.



National Academia Input
Search & Rescue, Law Enforcement

- Rapidly deploy medical teams and equipment to contain infected individuals within hotspot areas.
- Establish partnerships with public health authorities and experts to develop protocols for handling VBD cases encountered during SAR or law enforcement operations.

International Academia Input
Search & Rescue, Law Enforcement

- Set up quarantine and medical facilities overseen by trained healthcare providers and physicians.
- Conduct regular training sessions for Search & Rescue (SAR) and law enforcement personnel on identifying vector-borne diseases (VBDs), their symptoms, and preventive measures.

(h) Contingency – Food Security & Social Crises

National Academia Input
Individual & Community Level

- Implement efficient irrigation techniques like drip irrigation and rainwater harvesting to conserve water in the coastal areas of Sindh and Balochistan.
- Encourage community gardens, urban farming, and small-scale agriculture to increase local food production.

International Academia Input
Individual & Community Level

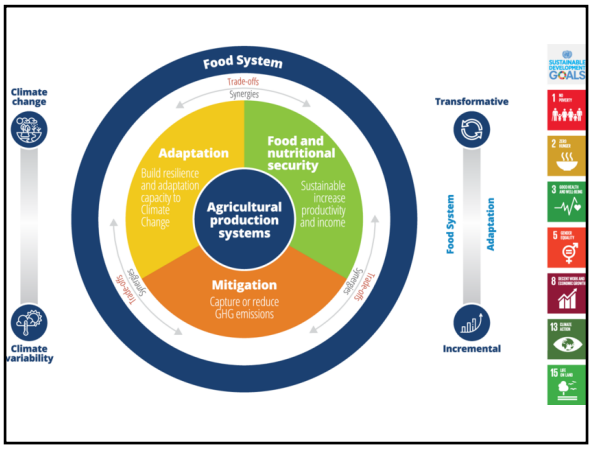
- Engage local communities in sustainable food production practices, such as community gardens, farmers markets, and cooperative farming initiatives. (Australia).
- Promote food preservation techniques such as drying, canning, and pickling to reduce food waste and ensure food availability during lean periods.
- Establish community-run food banks or food sharing programs to support those in need during times of crisis.

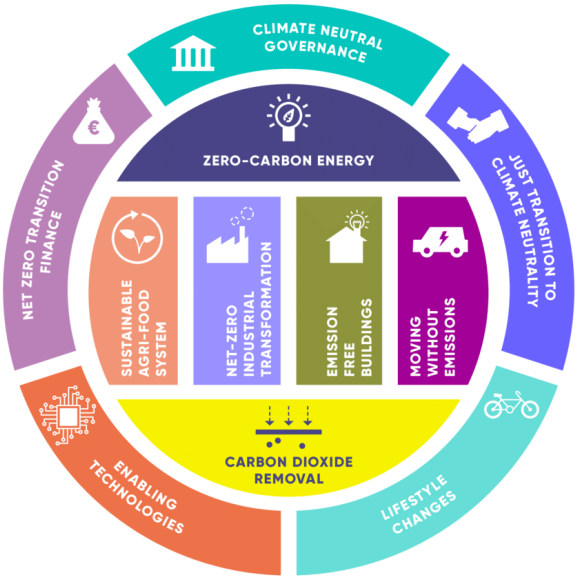
National Academia Input
Area Governance

- Pakistan must tackle food insecurity in both rural and urban areas through multi-sectoral interventions, focusing on enhancing production, processing, transportation, storage, and marketing.
- Pakistan needs to empower agriculture and livestock producers with better access to technology in the coastal areas.

International Academia Input
Area Governance

- Support sustainable agricultural practices like climate smart agriculture (CSA) which enhance the food production and resilience to climate change.
- Develop a sustainable, healthy, safe and climate neutral food system.(Finland)



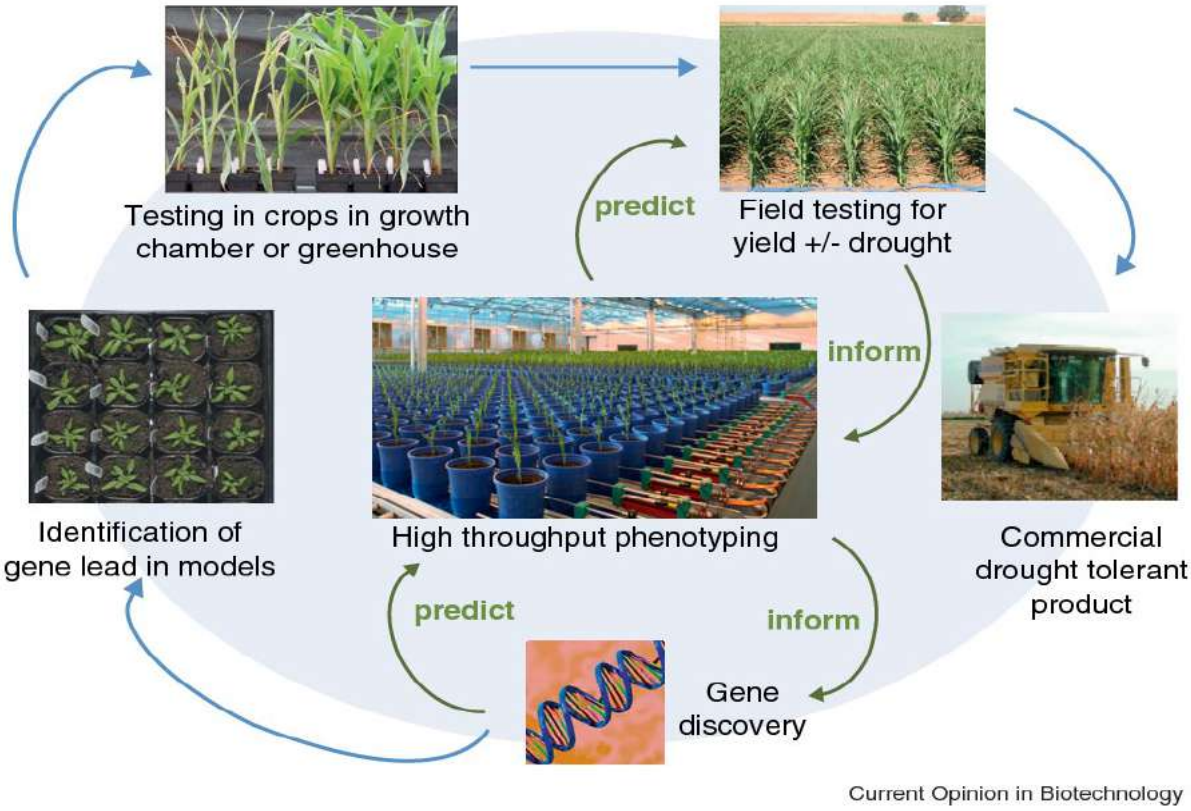


National Academia Input
Role of Federal Organizations

- It is recommended to cultivate drought resistant crops such as millet, sorghum, and wheat. (NARC)
- Provide education on nutrition and healthy eating habits to ensure community members have access to balanced diets.

International Academia Input
Role of Federal Organizations

- Monitoring of cultivated drought resistant crops and certain varieties of wheat and barley that require less water.
- Promote food preservation techniques such as drying, canning, and pickling to reduce food waste and ensure food availability during lean periods.



National Academia Input
Private Sector and Local Industry Role

- Develop an infrastructure, such as reliable irrigation systems and storage facilities, which are essential for increasing agricultural productivity in coastal areas of Pakistan.
- Collaborate with NGOs, academia, and government agencies to coordinate emergency response efforts and ensure efficient resource allocation.

International Academia Input
Private Sector and Local Industry Role

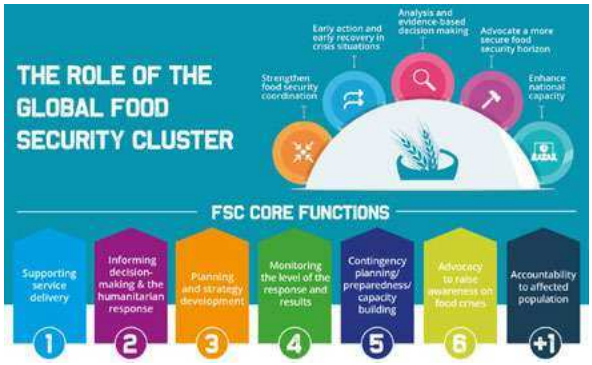
- Developed new crop varieties and farming techniques that are better suited to desert conditions, further enhancing food sustainability in coastal areas.
- Invest in research and development of innovative solutions for food security and social crises. This can include using technology such as data analytics and blockchain to improve food traceability and supply chain efficiency.

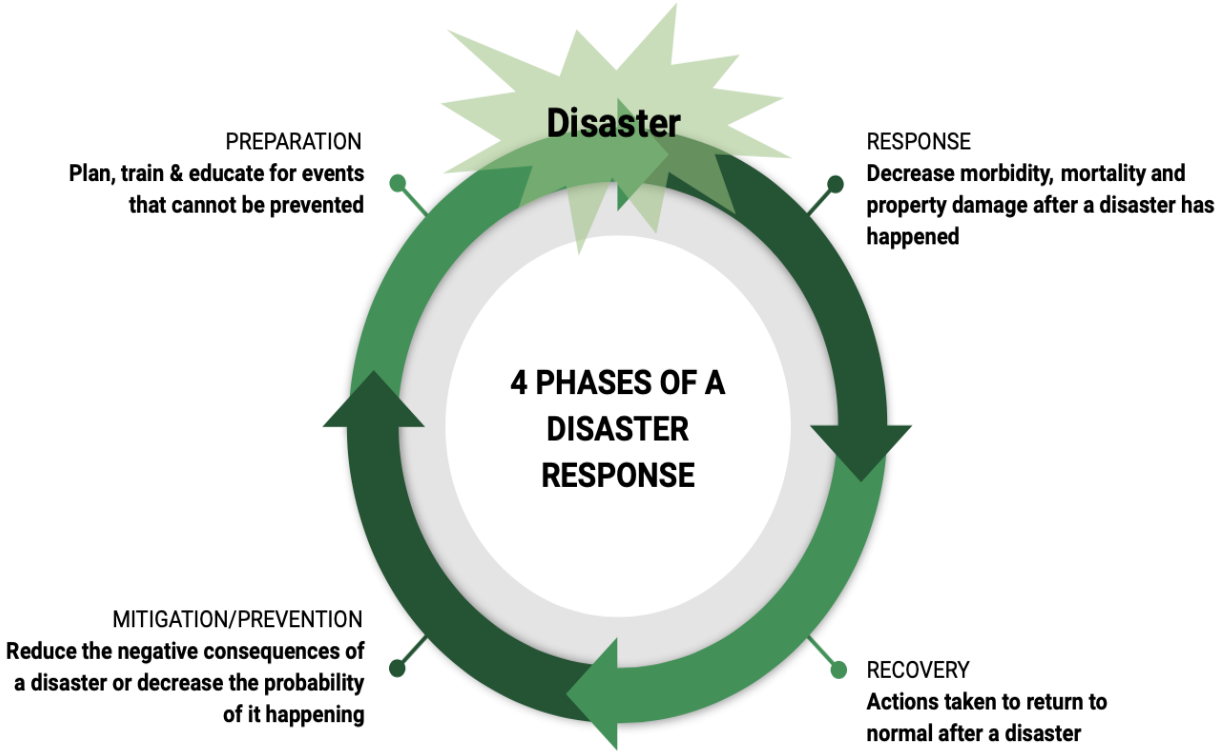
National Academia Input
NGOs, Humanitarian Resource Enablers

- Build the capacity of local communities and governments to better cope with food security and social crises.
- Support livelihoods in coastal areas of Sindh and Balochistan by promoting income generating activities such as small-scale agriculture and livestock farming.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Provide training on sustainable agriculture, water management, and disaster preparedness.
- Raise awareness about the challenges faced by communities living in coastal regions.



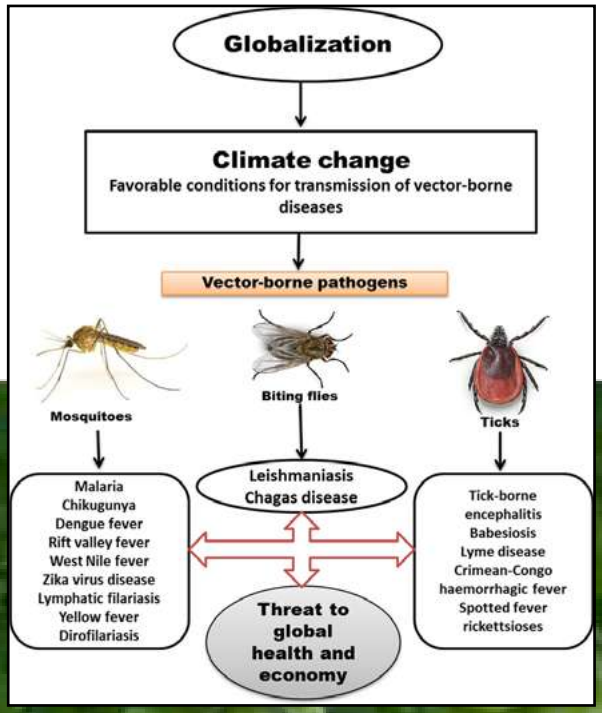


National Academia Input
Area Academia, Think Tanks

- Develop new technologies and approaches for improving food security in coastal areas, including drought-resistant crops, water harvesting techniques, and sustainable land management practices.
- Utilize hydroponic techniques to grow crops and enhance agricultural yields.

International Academia Input
Area Academia, Think Tanks

- Develop drought-resistant crop varieties, precision irrigation systems, and sustainable farming practices such as climate-smart agricultural (CSA) practices.
- Construct an innovative hydroponic system incorporating robotics and solar power to enhance food security (UAE).

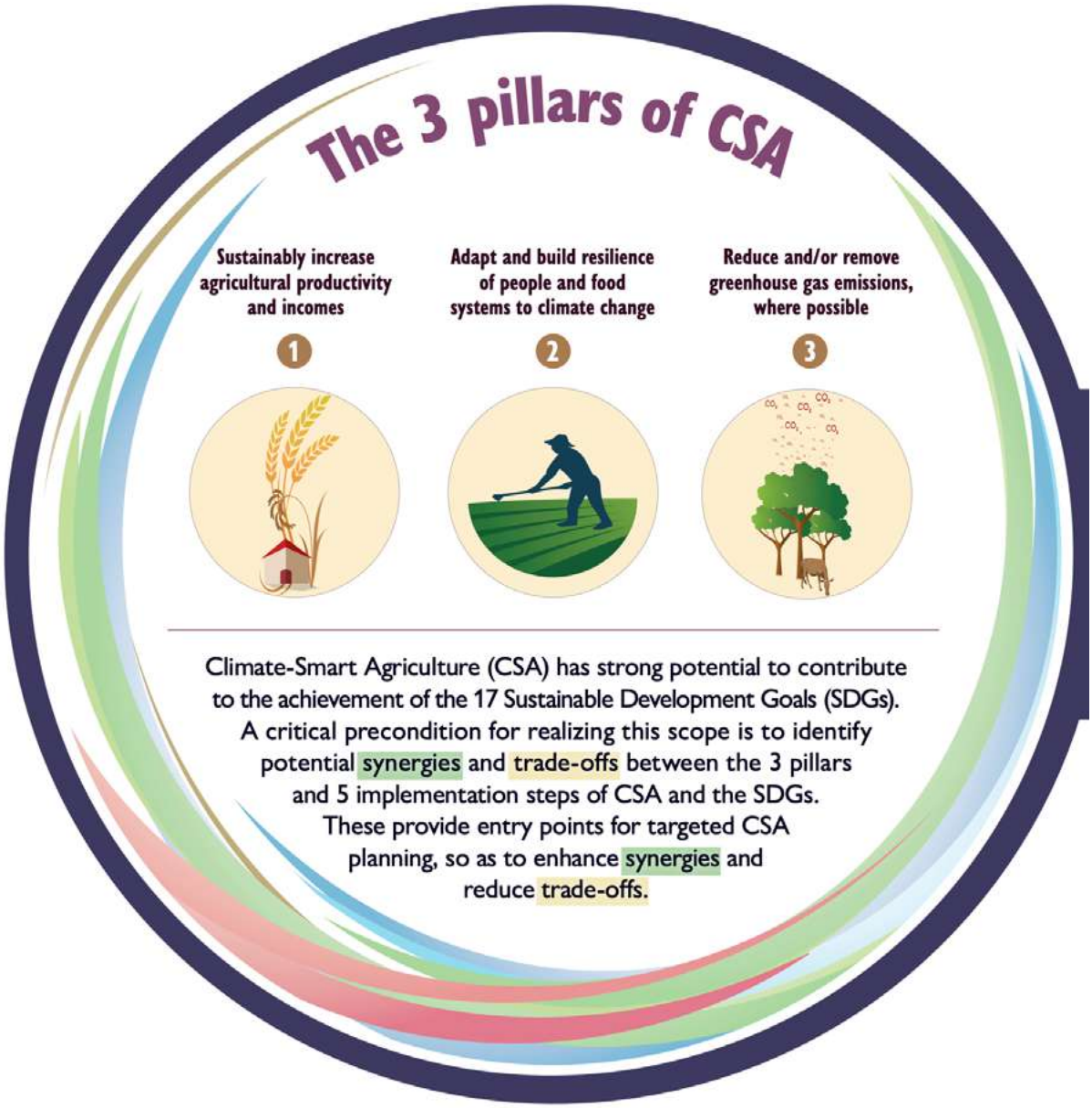


National Academia Input
Local Media and Early Warning Center

- Installation of Early warning systems coupled with AI software which can help to predict and mitigate food insecurity in coastal areas by monitoring weather patterns and crop yields.
- Local media can raise awareness about food insecurity issues in desert areas through news reports, documentaries, and community outreach programs.

International Academia Input
Local Media and Early Warning Center

- Effective data collection and analysis are essential for understanding the causes and impacts of food insecurity in Coastal areas.
- Local media can facilitate community discussions and forums to gather input and feedback on food security issues and solutions.



National Academia Input
Search & Rescue, Law Enforcement

- Rapidly and adequately support people vulnerable to food insecurity through humanitarian assistance from other organizations.
- Maintain an open trade system within regions, to allow food to flow from surplus areas to those in need.

International Academia Input
Search & Rescue, Law Enforcement

- The Global community should take decisive action to ensure the financing needed to deal with the immediate crisis and to strengthen food security in the medium to long term.
- There should be a coordinated response to the global food shock, offering policy advice, technical assistance, and financial support.

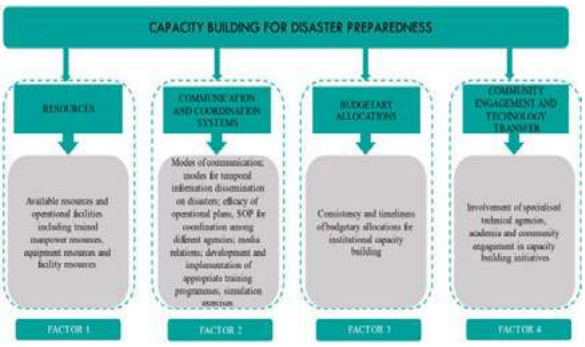
(i) Contingency – Gender Related Crises

National Academia Input
Individual & Community Level

- Projects should be developed for the communities, particularly involving women and girls in the design and implementation of projects.
- Provide training and capacity building programs for women in coastal areas to enhance their resilience and ability to cope with crises.

International Academia Input
Individual & Community Level

- Incorporating gender perspectives into crisis management plans to ensure that the specific needs and vulnerabilities of women and girls are addressed.
- Encourage collaboration between communities globally to share insights and best practices on creating inclusive crisis management strategies that consider the unique challenges faced by individuals of all genders.

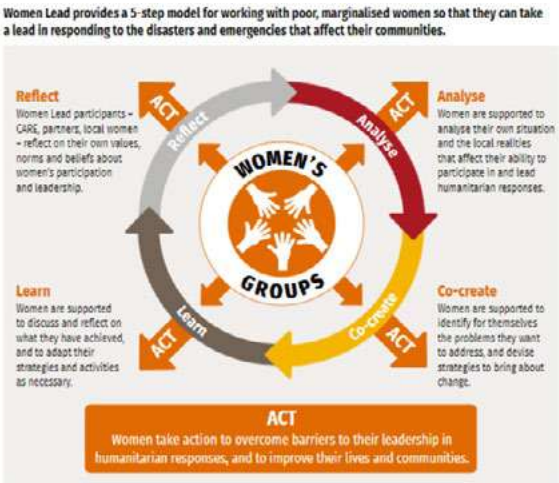


National Academia Input
Area Governance

- Legislation on gender equality is crucial to address the specific challenges faced by women and girls in these regions.
- Legislation can provide legal protection against gender-based discrimination and violence, ensuring that women and girls are able to live free from fear and harm.

International Academia Input
Area Governance

- Produce the yearly Gender Equality Index to evaluate the status of gender equality.
- Build women Platforms which would be a promising step towards gender inclusion and a potential driver of positive change within the region that make it possible to accelerate gender mainstreaming.

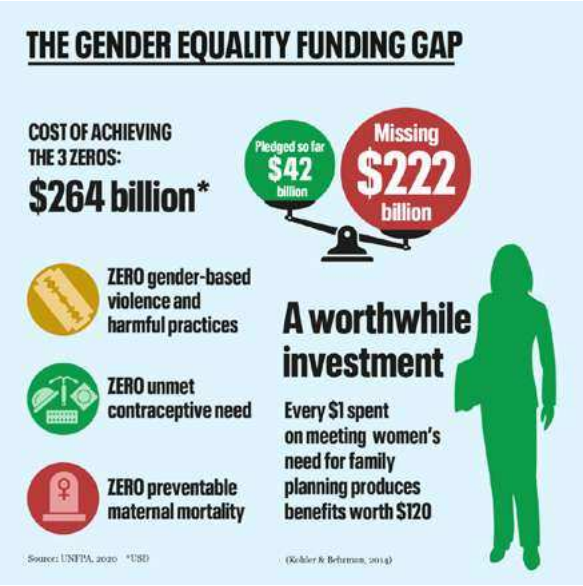


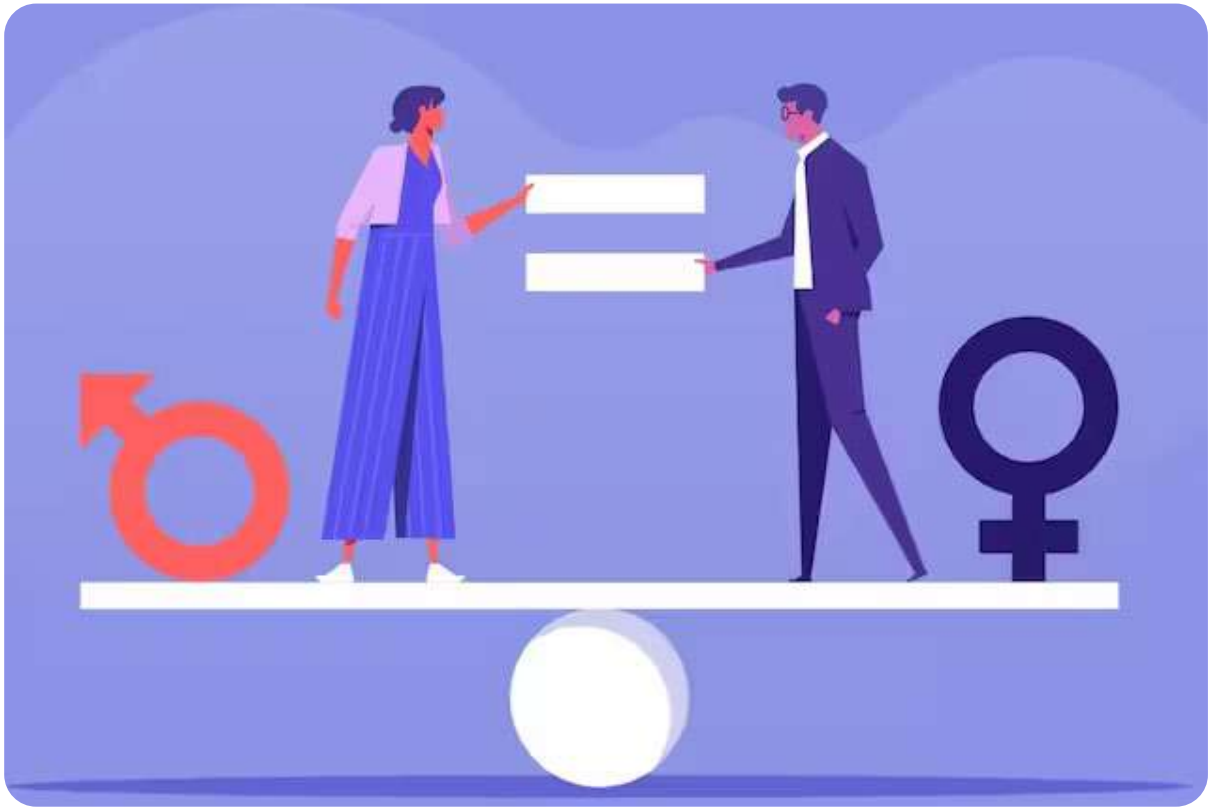
National Academia Input
Role of Federal Organizations

- Prohibition of discrimination against gender.
- Ensure that federal services, such as health care, legal aid, and social support, are accessible and responsive to the needs of individuals experiencing gender crises.

International Academia Input
Role of Federal Organizations

- Encourage women's participation in leadership and decision making at all levels, enhancing their influence on policies and resource allocation in the coastal areas.
- Develop and implement policies that promote gender equality and address the root causes of gender-based violence and discrimination.



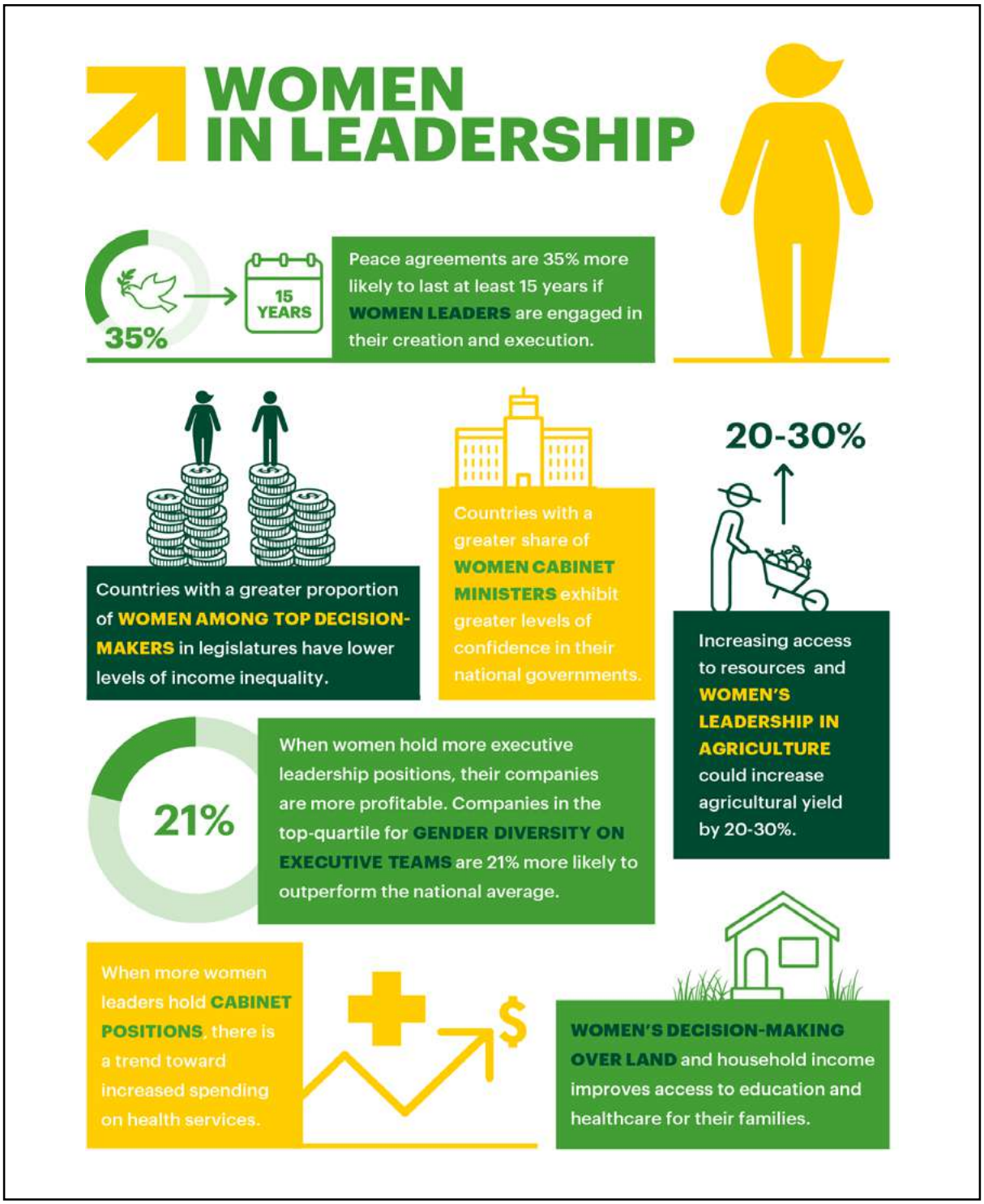


National Academia Input
Private Sector and Local Industry Role

- Make policies that include everyone in local businesses in Pakistan.
- Train employees to understand and support each other during crises, considering gender-specific needs.

International Academia Input
Private Sector and Local Industry Role

- Stick to global rules that promote fairness for everyone, no matter their gender, in crisis responses.
- Work with other industries globally to share simple and effective ways to handle gender related challenges during crises.

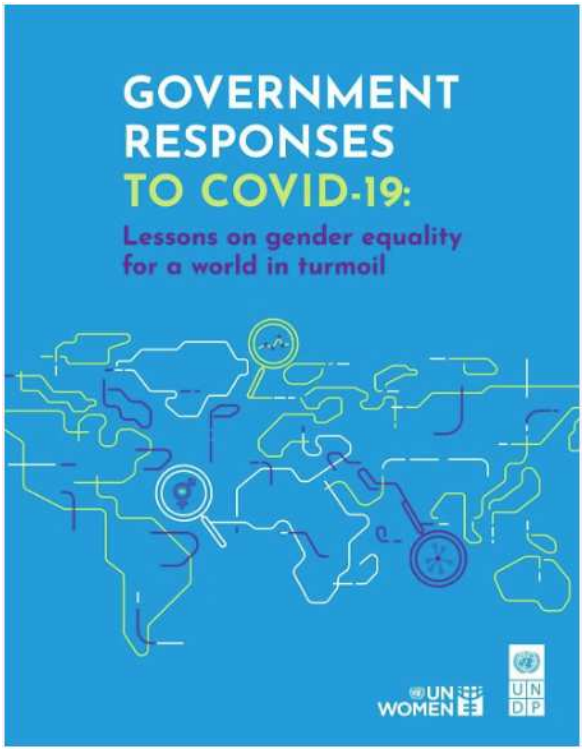


National Academia Input
NGOs, Humanitarian Resource Enablers

- Workshops should arrange to teach communities about gender needs during crises.
- Partner with local groups to make crisis responses more effective.
- Lead with a community focused approach to address gender challenges during crises in Pakistan.

International Academia Input
NGOs, Humanitarian Resource Enablers

- Share and use simple, effective best practices globally for responding to gender related issues and crises.
- Collaborate globally to respond quickly and efficiently to gender specific challenges during humanitarian crises.
- Advocate for global initiatives that prioritize sensitivity to gender needs in crisis response.



National Academia Input
Area Academia, Think Tanks

- Study gender related crises locally in Pakistan to understand and address community-specific challenges.
- Include gender-inclusive education in local academic programs to prepare for diverse needs during crises.
- Collaborate closely with local communities in Pakistan to involve academia in community driven solutions for gender challenges during crises.

International Academia Input
Area Academia, Think Tanks

- Collaborate with international academia and think tanks for a collective approach to understanding and responding to gender challenges during crises.
- Use research to influence global policies that prioritize gender sensitivity in crisis responses.
- Globally share simple and effective insights on addressing gender-related crises through research.

National Academia Input
Local Media and Early Warning Center

- Work with local communities to improve alerts, making them easy to understand and considerate of gender differences.
- Report on gender crises responsibly, avoiding sensationalism and victim-blaming.
- Highlight stories of individuals and organizations that are working to address gender crises and promote gender equality.

International Academia Input
Local Media and Early Warning Center

- Use the media to inform everyone about how crises affect different genders and what to do.
- media platforms should raise awareness about gender equality issues and promote positive gender norms.
- Collaborate with federal organizations, private industries, and NGOs to amplify messages about gender equality and support initiatives aimed at addressing gender crises.

National Academia Input
Search & Rescue, Law Enforcement

- Inform local communities in Pakistan for help in rescuing people, considering everyone's needs.
- Create local support networks in Pakistan that can help everyone during crises.

International Academia Input
Search & Rescue, Law Enforcement

- Collaborative efforts between law enforcement and coastal communities can build trust and enhance public safety
- Equip teams with cultural competency skills to ensure their assistance is sensitive to local customs and traditions.

(j) Contingency – Tourism Related Crises

National Academia Input
Individual & Community Level

- Strengthen the coastal communities' resilience by implementing better planning, zoning regulations, and construction standards.
- Engage communities in planning and implementation processes to foster a sense of ownership and commitment.

International Academia Input
Individual & Community Level

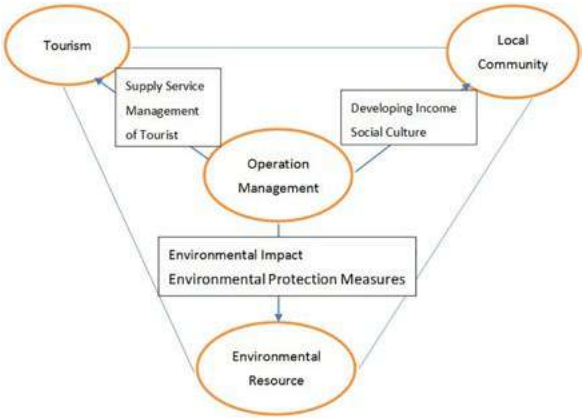
- Individuals and communities should advocate for and participate in coastal zoning and land use planning processes.
- Promote ecotourism, cultural tourism, adventure tourism, and other sustainable alternatives that showcase the unique assets and heritage of coastal areas.

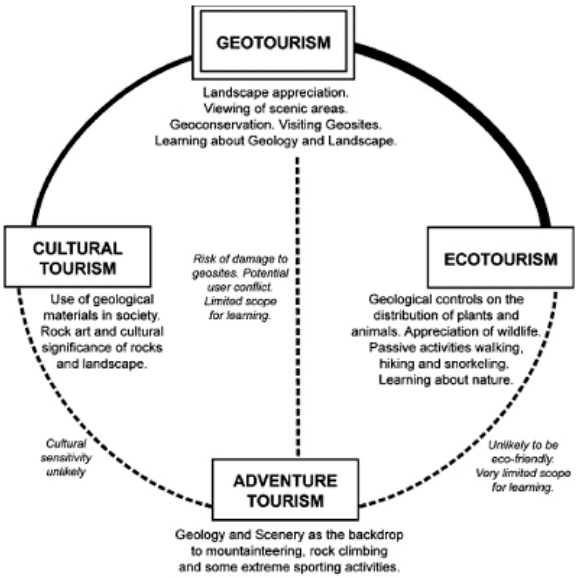
National Academia Input
Area Governance

- Implement measures to manage the number of visitors to coastal destinations, ensuring that they do not exceed the carrying capacity of the area.
- Establish and enforce regulations that ensure the safety and well-being of tourists, including standards for accommodation, transportation, and tour operators.

International Academia Input
Area Governance

- Involve local communities in tourism planning and decision-making processes to ensure that their interests and concerns are taken into account. Moreover, empower communities to participate in tourism management, benefit sharing, and cultural preservation efforts.
- Involve local communities in tourism planning and decision-making to ensure that tourism benefits are shared equitably.





National Academia Input
Role of Federal Organizations

- Invest in upgrading and expanding infrastructure and services to support sustainable tourism development.
- Develop and implement crisis management plans to respond effectively to emergencies and natural disasters that may affect tourists.

International Academia Input
Role of Federal Organizations

- Explore insurance options and disaster risk finance planning mechanisms to mitigate the economic risks associated with coastal tourism disasters.
- Invest in infrastructure development that supports sustainable tourism, such as improving roads, airports, and public transportation.

National Academia Input
Private Sector and Local Industry Role

- Encourage and incentivize tourists to adopt eco-friendly practices, such as reducing waste generation, conserving water and energy, and respecting the local ecosystem.
- Implement effective waste management systems in tourist facilities and promote recycling and responsible disposal.

International Academia Input
Private Sector and Local Industry Role

- Partner with NGOs and local communities to protect and restore coastal ecosystems like mangroves, coral reefs, and sand dunes.
- Collaborate with existing sustainable tourism departments to encourage and promote sustainable practices within the tourism industry.

National Academia Input
NGOs, Humanitarian Resource Enablers

- Mobilize emergency response teams, deploy relief supplies, and provide lifesaving assistance to affected communities.
- Build the capacity of local communities to engage with the tourism industry and benefit from tourism in a sustainable manner.

International Academia Input
NGOs, Humanitarian Resource Enablers

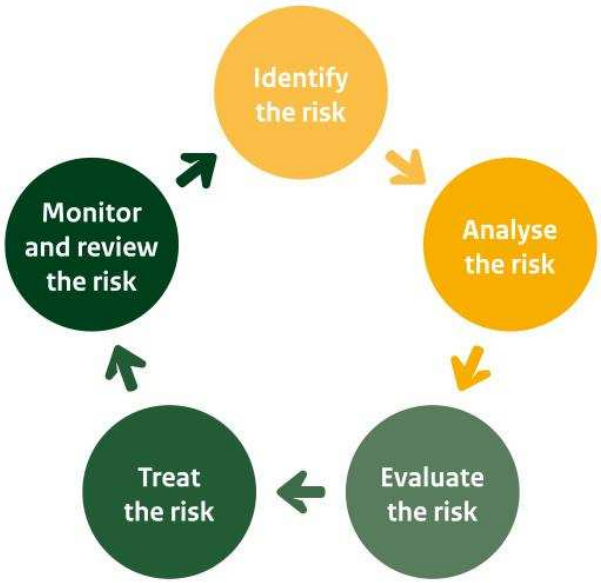
- Engage in community-based initiatives, participatory planning processes, and grassroots mobilization efforts to empower coastal communities to take ownership of their resilience building efforts.
- Support community development projects that benefit local communities affected by tourism, such as infrastructure improvements and skills training.

National Academia Input
Area Academia, Think Tanks

- Engage in policy dialogue, advocacy, and knowledge dissemination to inform policymakers, government agencies, and stakeholders about the importance of coastal resilience and disaster risk reduction.
- Academic institutions organize capacity building workshops, training programs, and educational initiatives to enhance the knowledge, skills, and awareness of coast

International Academia Input
Area Academia, Think Tanks

- Advocate for sustainable tourism practices, environmental conservation, and responsible development strategies.
- Use of geospatial analysis, remote sensing, mobile applications, and social media platforms to improve risk communication, decision support systems, and situational awareness during emergencies.



National Academia Input
Local Media and Early Warning Center

- Early warnings should be issued by meteorological authorities providing advance notice of potential storm surges, high winds, and heavy rainfall.
- Tourists are advised to swim only in designated areas, heed lifeguard warnings, and avoid venturing into the water during adverse weather conditions.

International Academia Input
Local Media and Early Warning Center

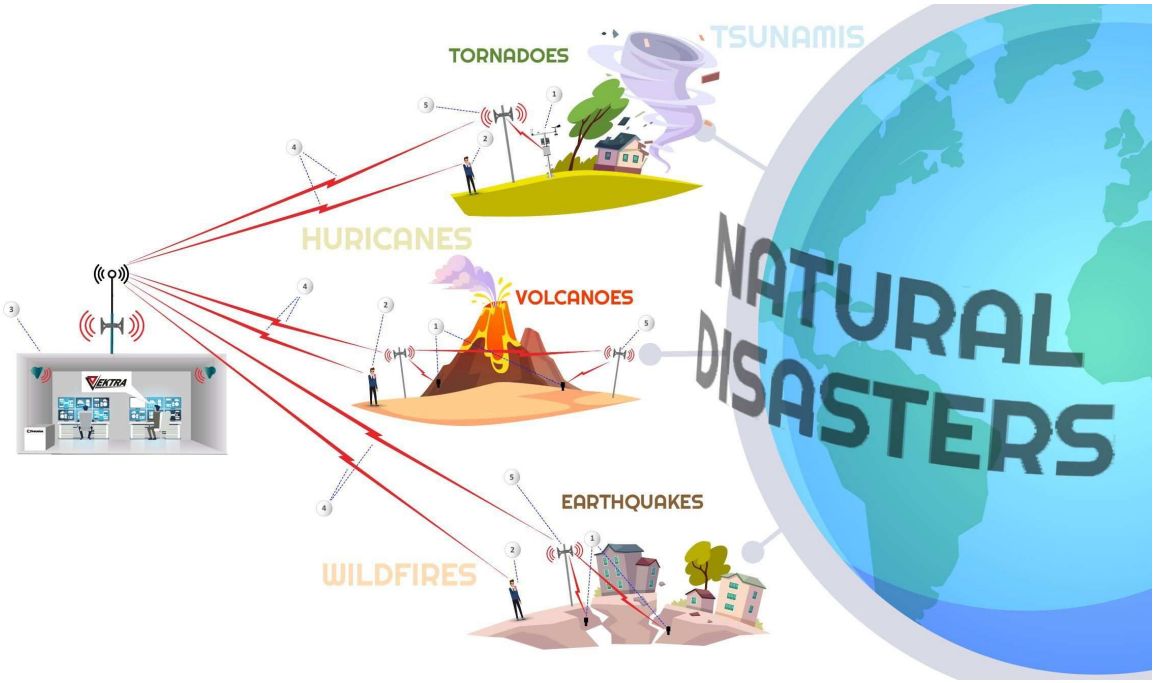
- Develop and utilize early warning systems that make use of weather data and modeling to anticipate floods and allow authorities to take preemptive measures.
- Install Tsunami warning systems, including seismic monitoring networks and buoy sensors which provide timely alerts to coastal communities.

National Academia Input
Search & Rescue, Law Enforcement

- Develop and enforce regulatory frameworks that govern tourism activities, land use, construction, and environmental protection in coastal areas.
- Manage traffic flow and crowd movements to prevent congestion, ensure public safety, and facilitate emergency access for responders.
- Coordinate emergency response efforts in collaboration with other first responders, including coast guard units, medical services, and search and rescue teams.
- Rescue teams must trained by medical personnel who provide emergency medical care and first aid to injure or ill tourists along the coast.

International Academia Input
Search & Rescue, Law Enforcement

- Monitor tourist activities and identify potential hazards or risky behaviors.
- Specialized rescue teams should be proficient in water rescue techniques like swift water rescue methods.
- Monitor coastal areas to prevent criminal activities such as theft, vandalism, illegal fishing, and human trafficking, which can undermine the safety and security of tourists and local residents alike.
- Engage local communities, volunteer organizations to foster community resilience and build partnerships for disaster preparedness and response.



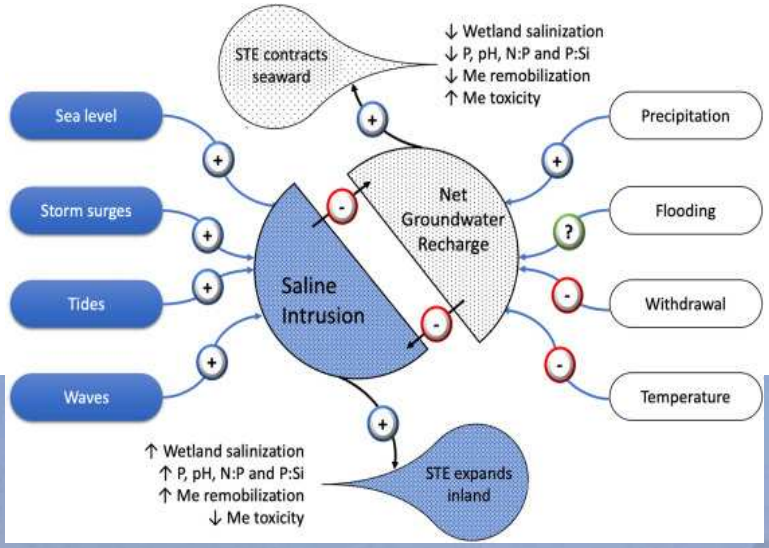
(k) Contingency – Seawater Intrusion

National Academia Input Individual & Community Level

- Promote water conservation practices to reduce dependency on groundwater. Encourage collection of rainwater to reduce reliance on groundwater.
- Promote the use of treated wastewater for non-potable uses to reduce demand on freshwater. Build dikes and seawalls to protect freshwater aquifers from seawater intrusion.
- Replant native vegetation to reduce land salinization and protect groundwater reserves. Use desalination technology to provide alternative freshwater sources.
- Encourage rainwater collection systems for local communities to reduce reliance on groundwater. Implement artificial recharge systems to restore the water table.

International Academia Input Individual & Community Level

- Promote education on sustainable water use practices for both individuals and communities. Promote water-efficient practices and reducing water waste.
- Build recharge wells and artificial recharge systems to restore groundwater levels. Manage coastal ecosystems and freshwater resources holistically.

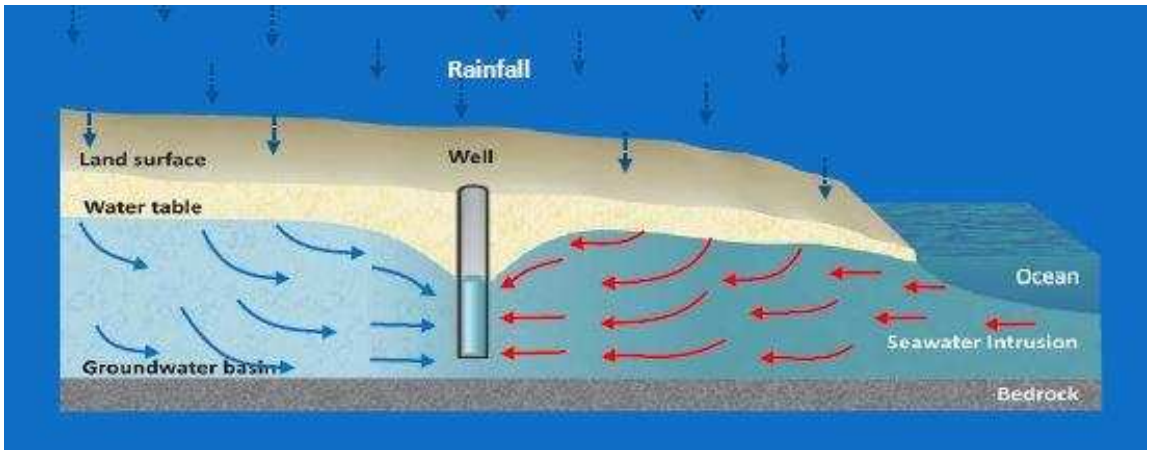


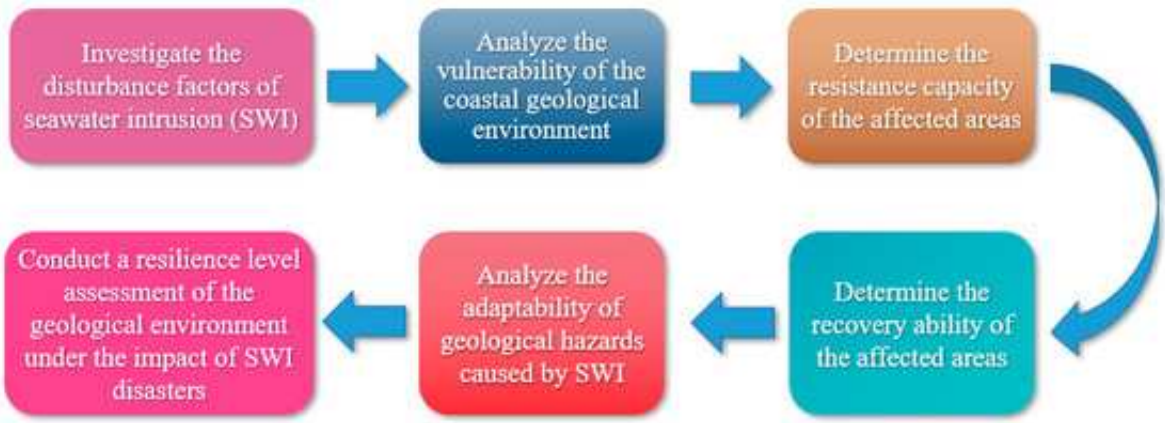
National Academia Input
Area Governance

- Adopt coastal zone management regulations to protect aquifers. Use Integrated Coastal Management (ICM) for sustainable development.
- Limit groundwater extraction to prevent overuse. Use marine Spatial Planning to manage coastal resources.
- Strengthen water quality monitoring systems for early detection of intrusion. Implement desalination technologies to reduce reliance on fresh groundwater.
- Promote sustainable agriculture to reduce water waste. Adopt community-based management of coastal resources.

International Academia Input
Area Governance

- Create protection zones around critical aquifers. Develop coastal aquifer protection programs (e.g., Mediterranean countries).
- Launch public awareness campaigns on water conservation practices. Follow International water-sharing agreements for coastal aquifers.



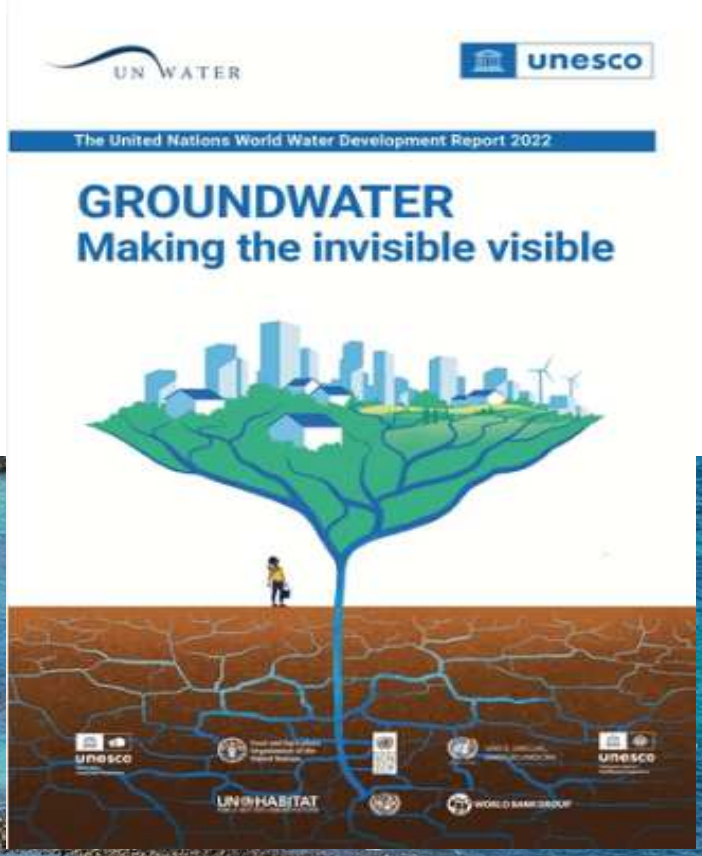


National Academia Input
Role of Federal Organizations

- Establish national policies for groundwater management. International cooperation on coastal and groundwater resource management (e.g., UN).
- Implement federal regulations on groundwater extraction limits. Adopt global monitoring systems for tracking sea water intrusion (e.g., UNESCO).
- Coordinate with local governments for integrated management. Federal-level coordination with neighboring countries on coastal aquifer protection (e.g., USA and Mexico).

International Academia Input
Role of Federal Organizations

- Funding research and innovation on sustainable water technologies. International knowledge-sharing platforms for best practices (e.g., World Bank).
- Develop national early warning systems for saltwater intrusion. Multilateral agreements for managing transboundary aquifers (e.g., Nile Basin Initiative).
- Providing technical support to regional water management bodies. Joint projects and funding for coastal protection and rehabilitation



National Academia Input

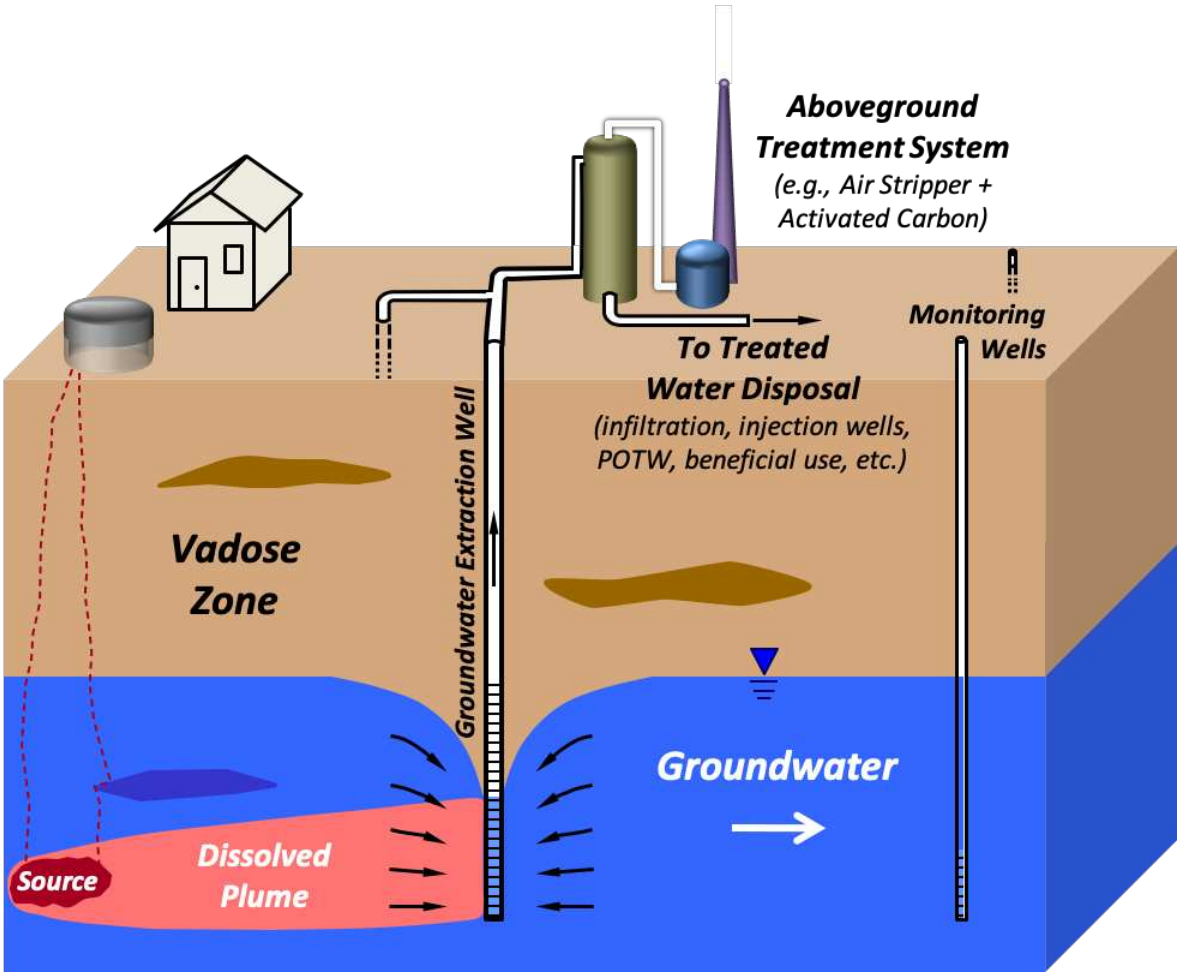
Private Sector and Local Industry Role

- Invest in sustainable water extraction technologies to prevent overuse. Adopt water-efficient technologies in industries (e.g., Australia).
- Develop and promote saltwater-resistant crops for agricultural use. Collaborate with NGOs for community water management solutions (e.g., private-public partnerships).
- Implement corporate water stewardship programs to reduce consumption. Global partnerships for desalination projects in water-scarce areas (e.g., Middle East).
- Support the use of alternative water sources like treated wastewater. Private sector funding for research on sea water intrusion solutions (e.g., USA, EU).

International Academia Input

Private Sector and Local Industry Role

- Partnering with local governments to ensure sustainable aquifer management. Corporate involvement in coastal ecosystem restoration (e.g., Shell, BP).
- Creating awareness campaigns on responsible water use within local industries.
  International best practices in industrial water reuse to mitigate saltwater intrusion (e.g., Singapore).

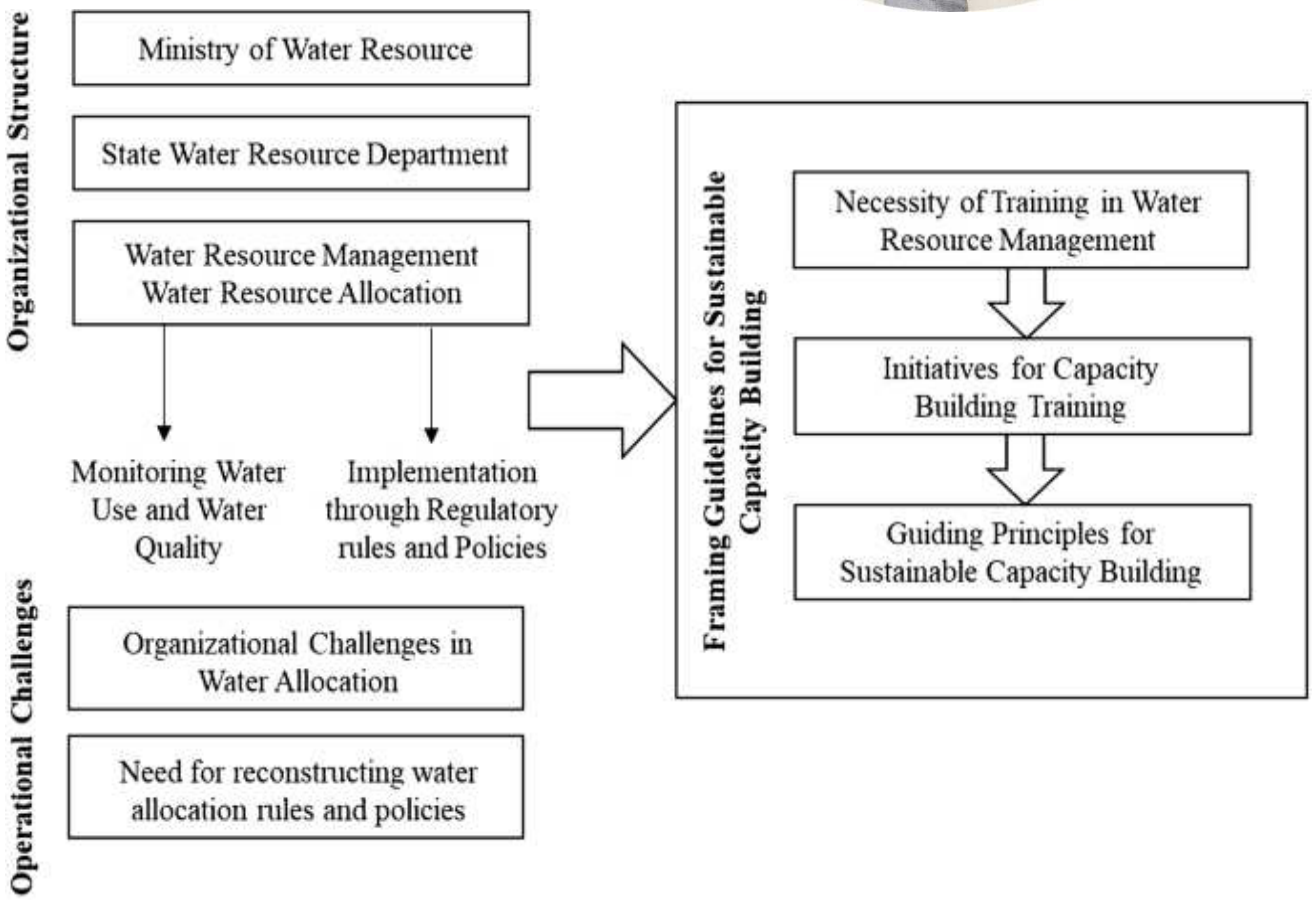


National Academia Input
NGOs, Humanitarian Resource Enablers

- Advocate for sustainable water use policies in coastal communities. Global partnerships to tackle sea water intrusion.
- Provide training and capacity building for local water management. Cross-border collaborations for managing shared water resources (e.g., Nile Basin).
- Support water conservation programs in vulnerable regions.Humanitarian aid for coastal communities affected by water scarcity (e.g., Red Cross).
- Facilitate the implementation of low-cost desalination systems. Community-driven water projects supported by international organizations (e.g., UNICEF).

International Academia Input
NGOs, Humanitarian Resource Enablers

- Promote rainwater harvesting in areas affected by saltwater intrusion. International knowledge exchange on effective sea water intrusion management.
- Conducting research and assessments to identify at-risk communities. Support policy advocacy on sustainable groundwater management.

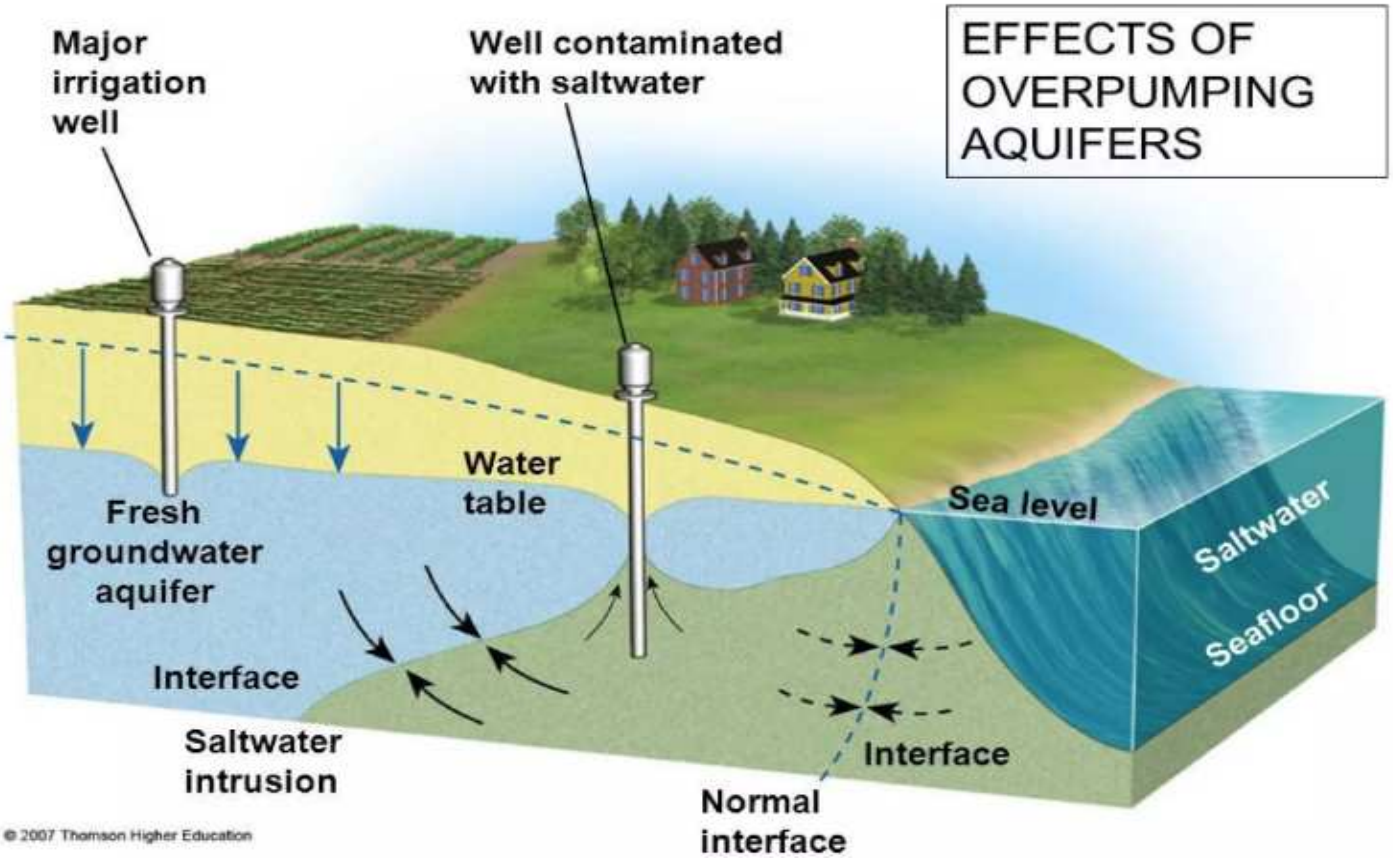


National Academia Input
Area Academia, Think Tanks

- Conduct research on innovative groundwater management techniques. Collaborate global research for sustainable water use.
- Develop educational programs on the impacts of sea water intrusion. Sharing academic findings through international conferences (e.g., Water for Food Global Conference).
- Training students and professionals in integrated coastal zone management. International academic collaborations for sea water intrusion solutions.
- Promote water conservation policies through academic studies. Joint research on desalination and alternative water sources

International Academia Input
Area Academia, Think Tanks

- Engaging in local projects to monitor and assess saltwater intrusion. Global knowledge-sharing networks for coastal protection research.
- Creating partnerships with local governments for policy development. Research on climate change impact on sea water intrusion and groundwater.

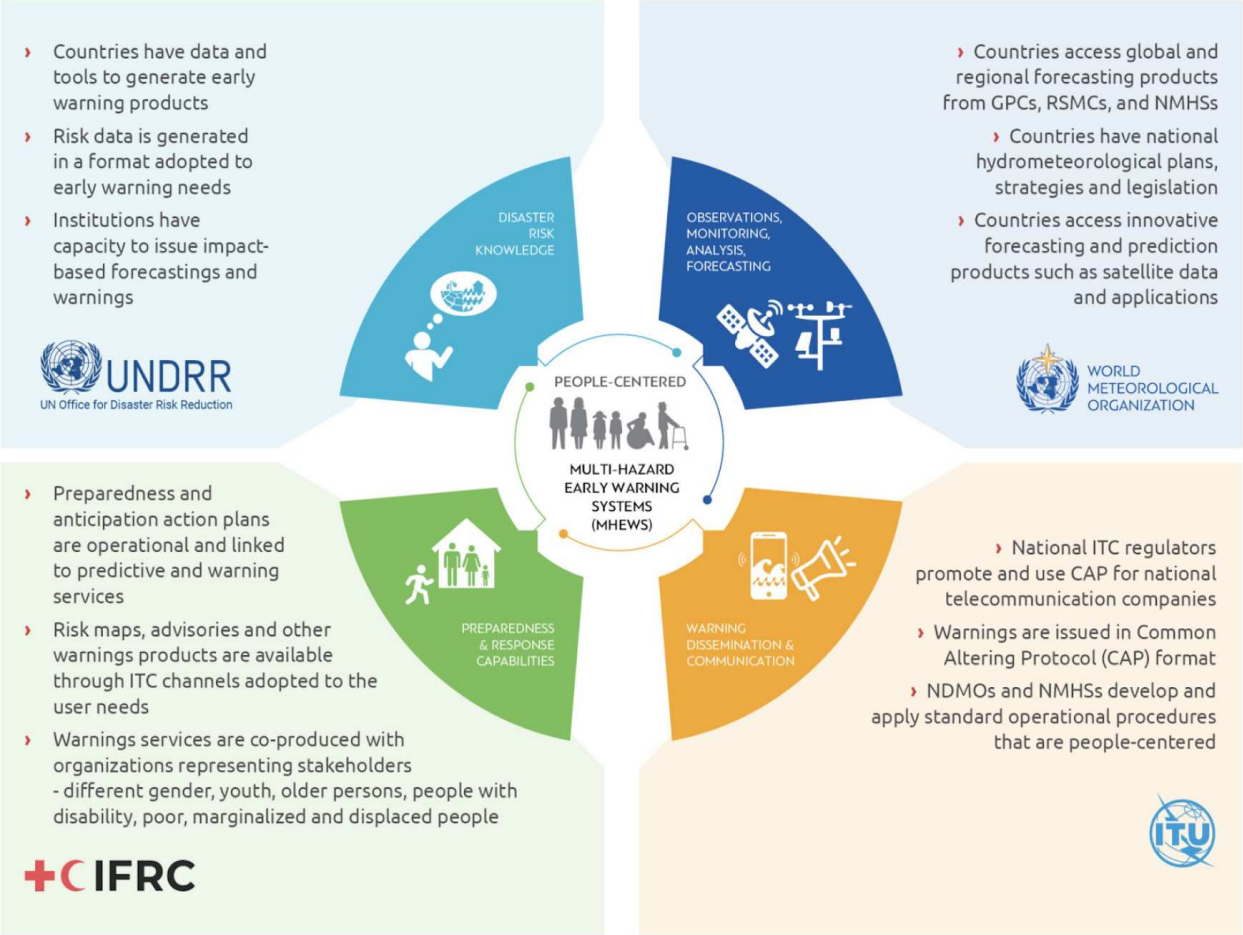


National Academia Input
Local Media and Early Warning Center

- Raise public awareness on the risks of sea water intrusion. Global early warning systems for coastal and groundwater threats (e.g., UN, WHO).
- Broadcasting educational campaigns on water conservation and saltwater intrusion. Mediacollaboration with environmental agencies for sea water intrusion alerts.
- Partnering with local authorities to inform communities about saltwater risks. International media partnerships to amplify sea water intrusion issues (e.g., Climate Change Media Partnership).
- Disseminating timely information about saltwater intrusion impacts. Real-time data sharing through international networks (e.g., Global Water Partnership).

International Academia Input
Local Media and Early Warning Center

- Supporting the use of local radio and TV for emergency alerts on water quality. Cross-border collaboration on monitoring systems for coastal areas (e.g., European Space Agency).
- Training journalists and media personnel on environmental reporting. International early warning networks for communities at risk of water contamination.



National Academia Input
Search & Rescue, Law Enforcement

- Coordinate with local authorities for disaster preparedness plans. International cooperation for search and rescue in coastal areas.
- Establish rapid response teams for communities affected by saltwater intrusion. Cross-border law enforcement collaboration to prevent illegal groundwater extraction.
- Training law enforcement in enforcing environmental protection laws. Global search and rescue operations for natural disasters affecting coastal zones.
- Improve access to clean water during saltwater contamination crises. Joint international exercises for coordinated rescue operations.

International Academia Input
Search & Rescue, Law Enforcement

- Monitoring coastal areas to prevent illegal activities that worsen intrusion. Cross-border monitoring and enforcement for water resource protection.
- Implement early warning systems for coastal communities at risk. Global coordination for rapid response to water contamination.

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